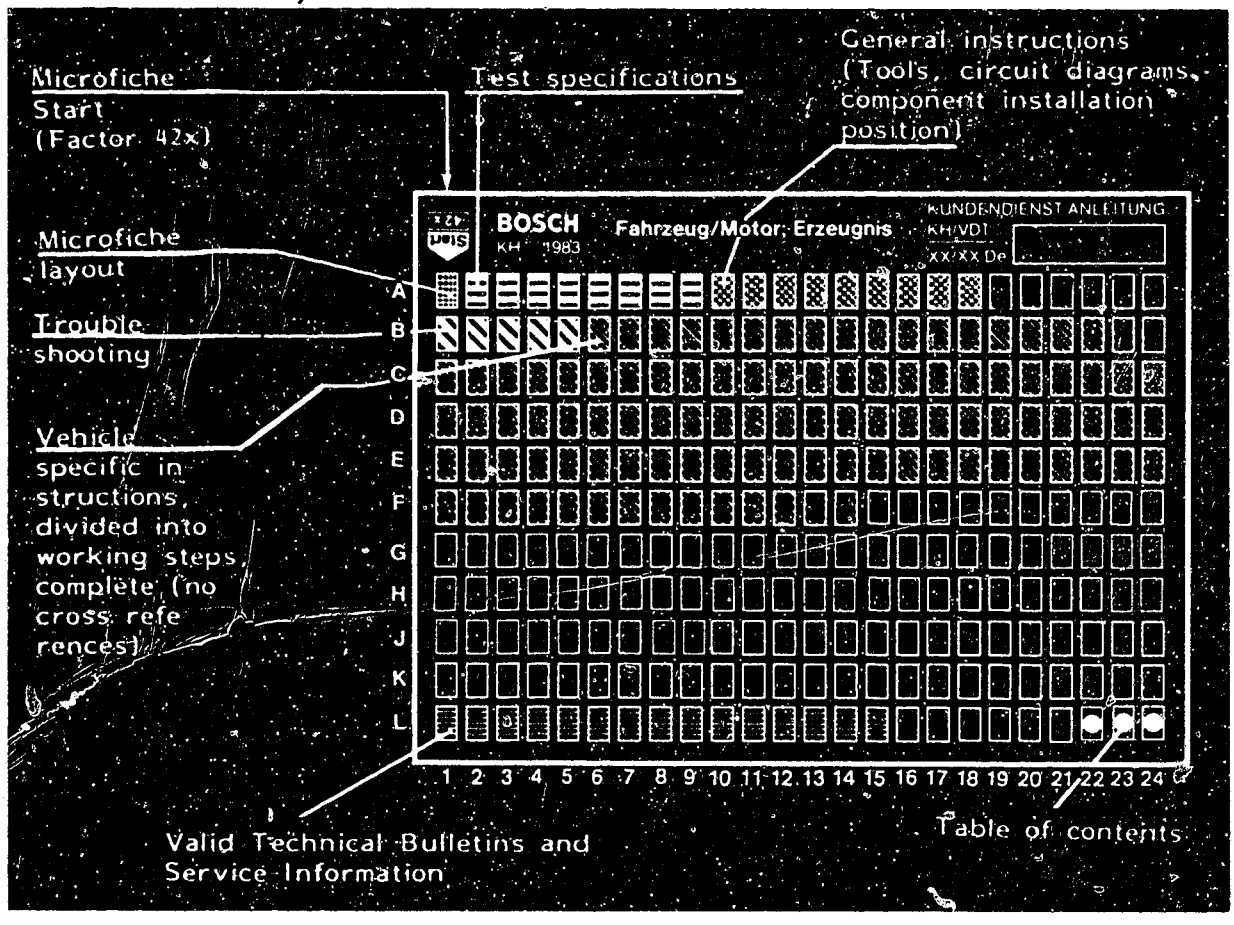
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning	Mid-section	End	One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

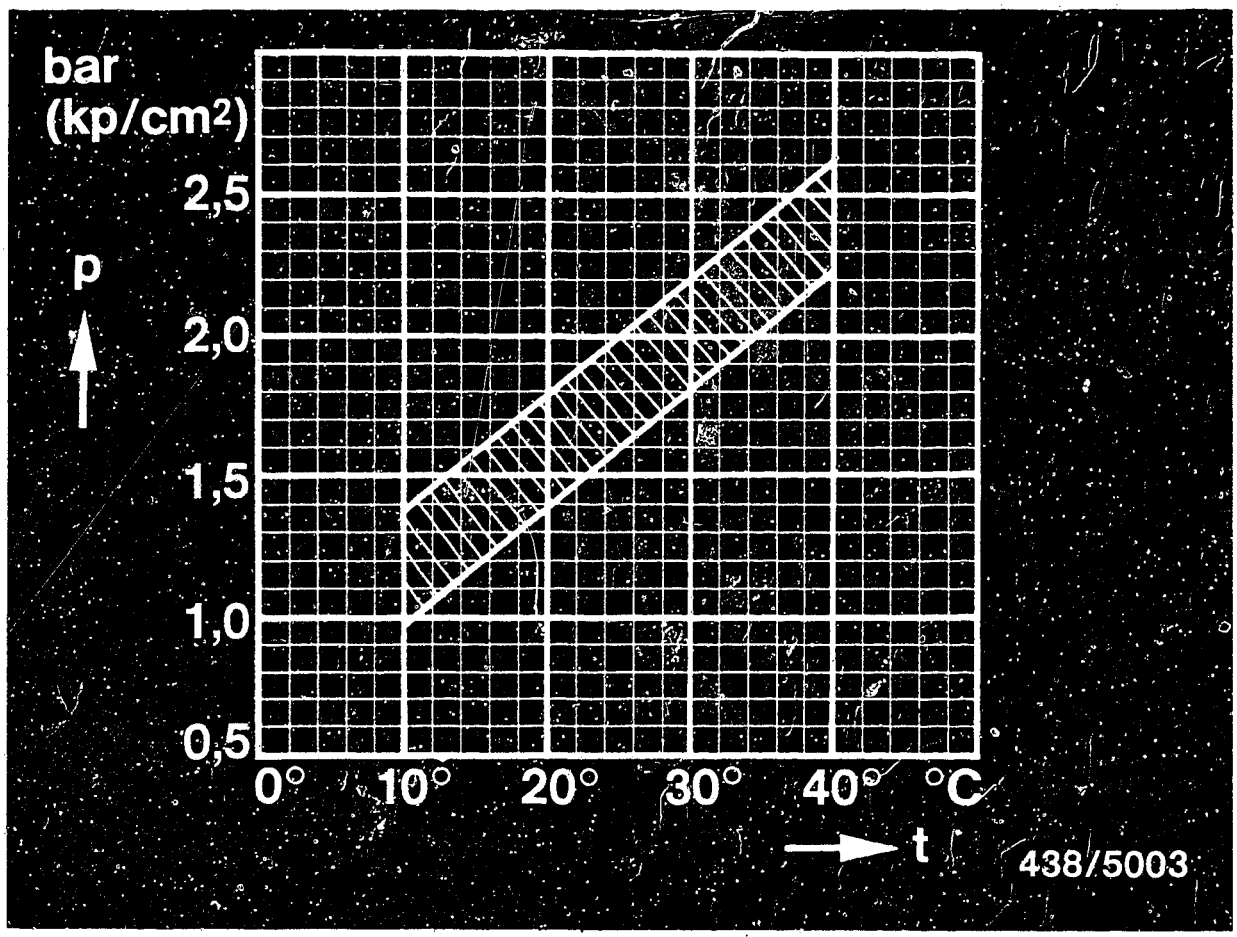
C6

1. Test specifications

1.1 Electric fuel pump

C4

Test step	Test specifications
Fuel delivery	min. 750 cm^3/30 s



p = Control pressure (gauge pressure)
t = Ambient temperature

C20

1.2 Control pressure "cold"

Part No. of warm-up regulator: 0 438 140 002
004

Test step	Test specifications*

D5

1.4 Primary pressure

Test specification:	4.5...5.2 bar (4.6...5.3 kgf/cm²)
Setting value:	4.7...4.9 bar (4.8...5.0 kgf/cm²)

D13

1.5 Leak test

Minimum pressure after 10 minutes: 1,7 bar (1,8 kgf/cm²)
after 20 minutes: 1,5 bar (1,6 kgf/cm²)

E7

1.6 Injection valves

Opening pressure: 2.5...3.6 bar (2.6...3.7 kgf/cm²)

E17

1.7 Fuel distributor

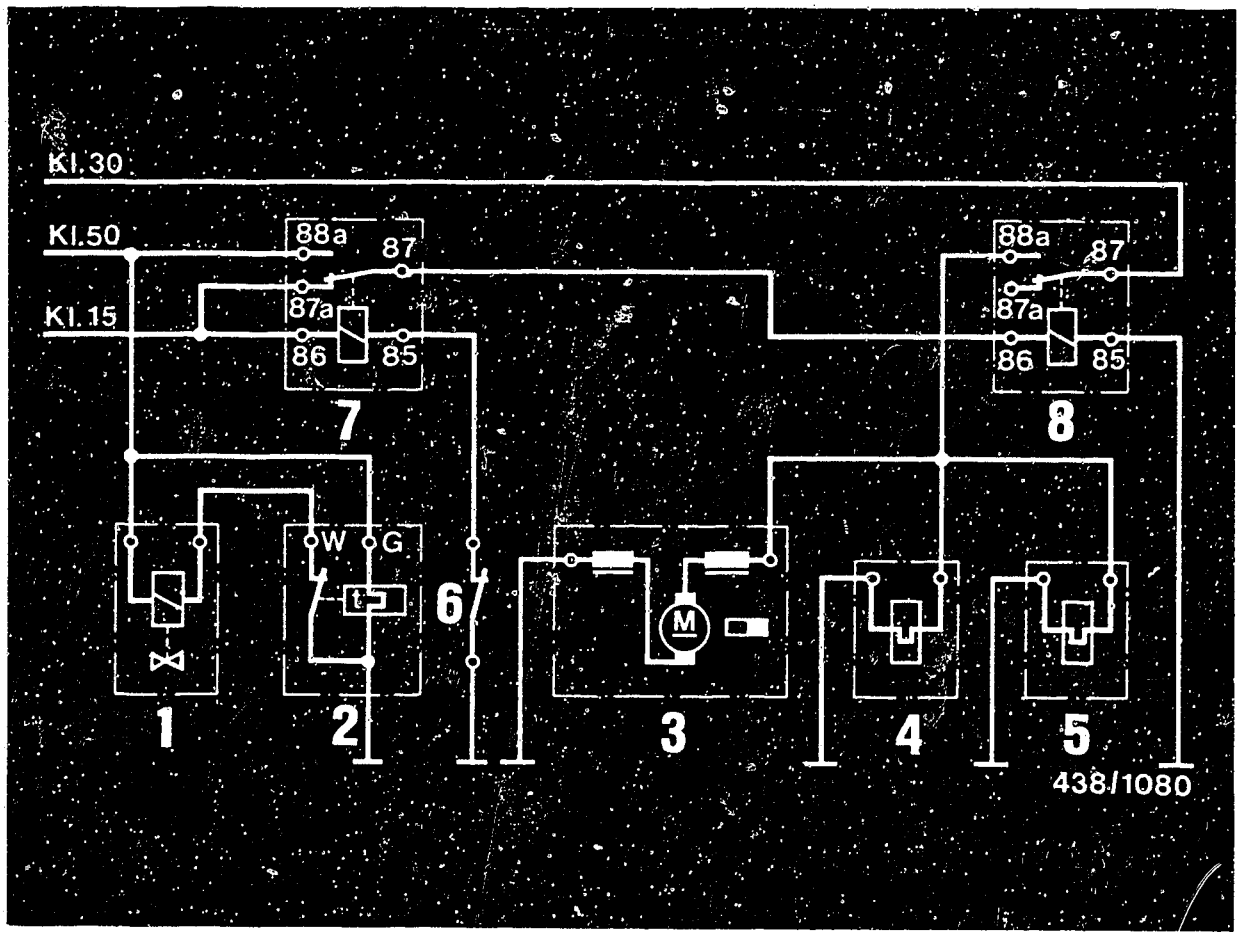
0 438 100 003
0 438 100 005

Delivered-quantity comparison at the outlets:	Setting point cm³/min	Max. allowable delivery cm³/min
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160,0	175,0

* Pressures in the test specification table are given in bar (gauge pressure) and in kgf/cm² (gauge pressure).

1.8 Idle adjustment

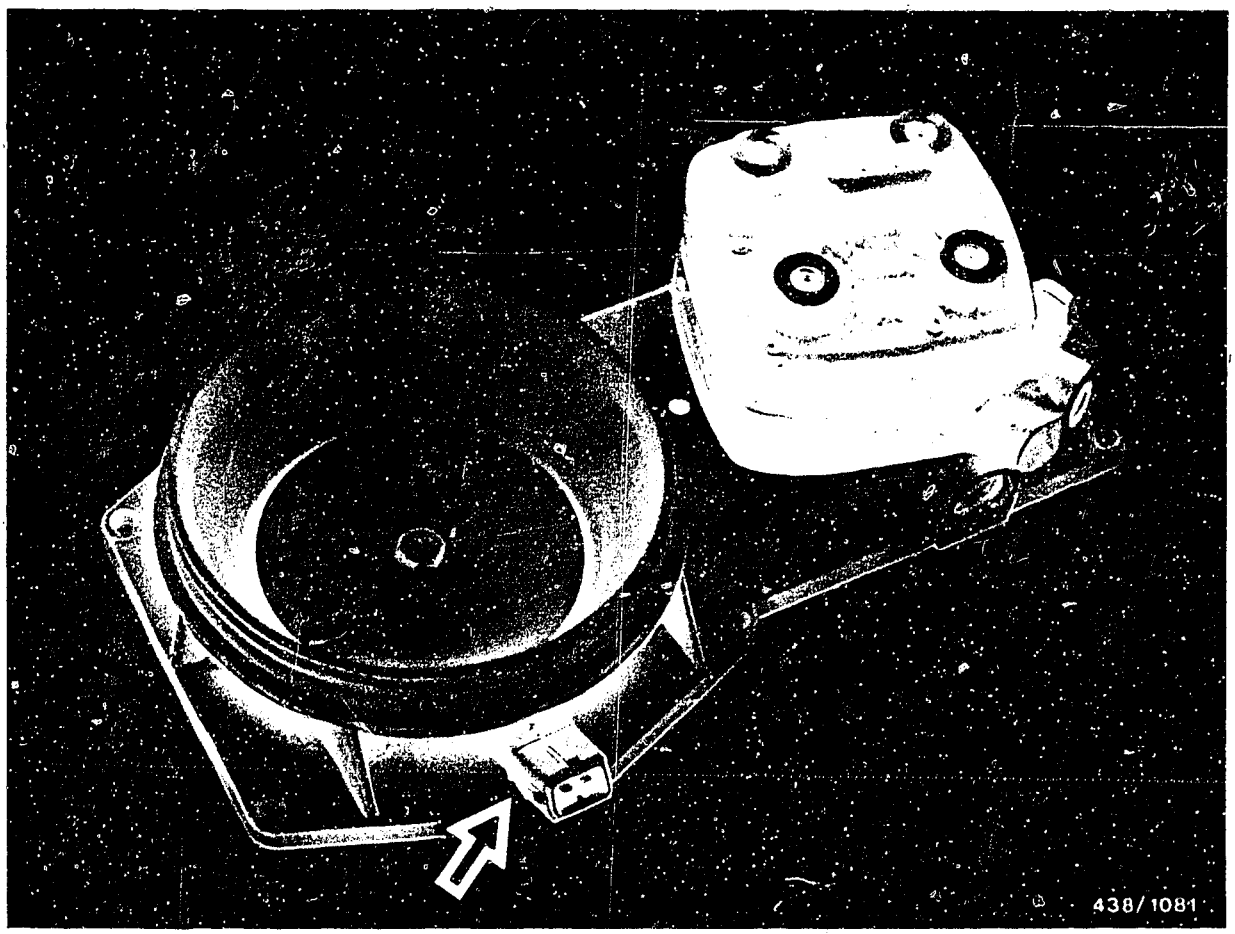
Idle speed:	900 min⁻ (manually-shifted transmission) 800 min⁻ (automatic)
CO concentration: (% by vol.)	0.5...3.0 % 0.5...1.5 % (USA) max. 0.5 % (USA - California with catalytic converter)



2. Electrical circuit diagram (safety circuit)

2.1 Circuit diagram

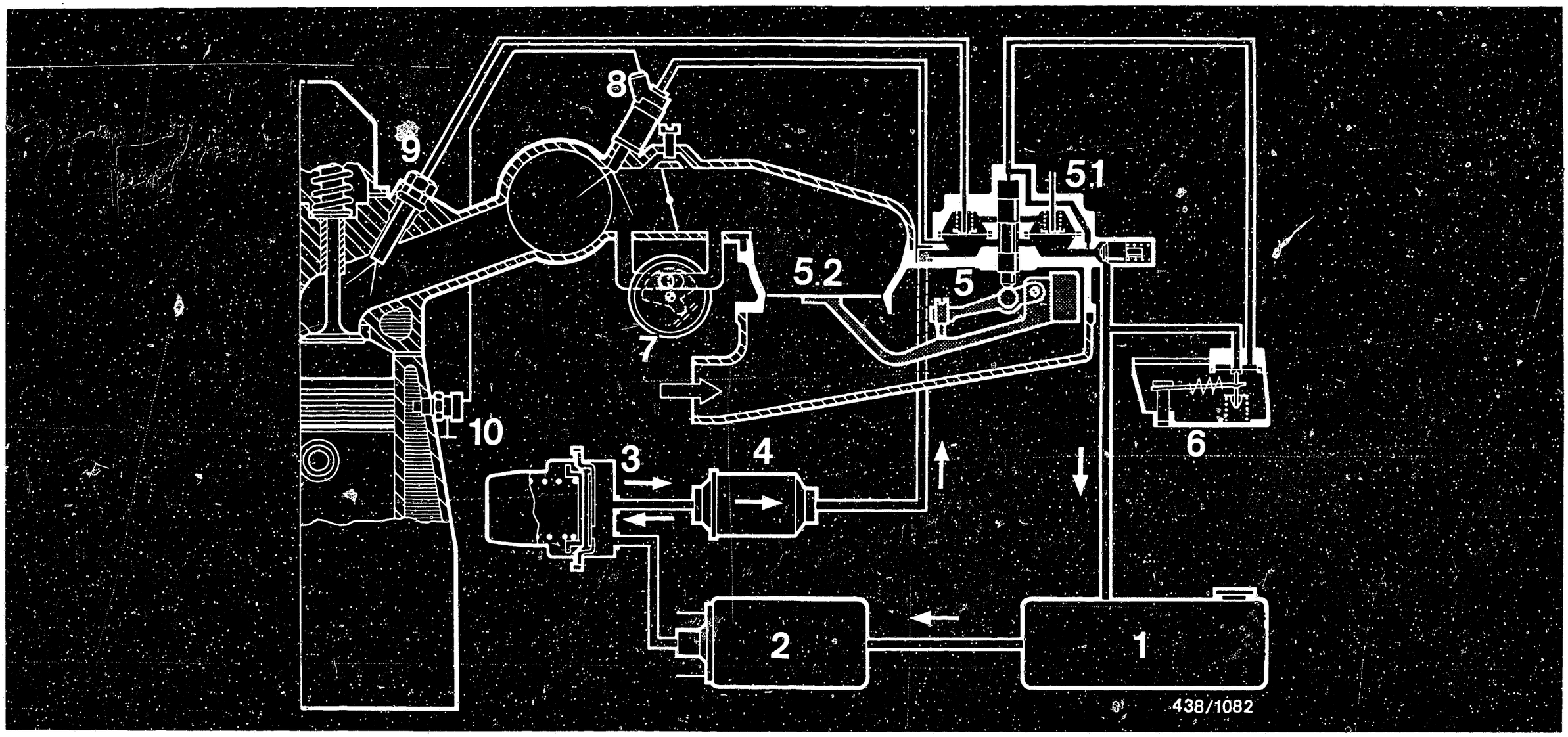
1 = Start valve
2 = Thermo-time switch
3 = Electric fuel pump
4 = Warm-up regulator
5 = Auxiliary-air device
6 = Air-flow sensor contact
7 = Relay I
8 = Relay II



2.2 Bridging the safety circuit

To bridge the safety circuit, it is sufficient to switch on the ignition and to remove the plug from the socket on the air-flow sensor (arrow).

The electric fuel pump, warm-up regulator and auxiliary-air device are energized through relays I and II whereby the ignition must be on and the contact in the air-flow sensor must be open (air-flow sensor plate raised).



3. Diagram of fuel lines

1 = Fuel tank
2 = Electric fuel pump
3 = Fuel accumulator
4 = Fuel filter
5 = Mixture-control unit
5.1 = Fuel distributor
5.2 = Air-flow sensor
6 = Warm-up regulator
7 = Auxiliary-air device
8 = Start valve
9 = Injection valve
10 = Thermo-time switch

4. General information

4.1 Introduction

These repair instructions refer to the Volvo vehicle type 140/240.. with engine B 20 E (Europe) and B 20 F (USA) of model years 1974/1975. These two engine versions have been grouped together because they do not differ externally or with regard to the K-Jetronic.

The manual gives a concise description of the testing and adjustment operations to be performed on the vehicle on the K-Jetronic.

All the system components are dealt with in separate working steps with the corresponding test specifications.

In addition to this repair manual the appropriate testing and repair manuals will, of course, be issued for every other vehicle type equipped with the K-Jetronic.

The K-Jetronic differs from other known fuel-injection systems in terms of both construction and operation. In order to be able to carry out the testing procedures described in this manual - and therefore to be able to assess the components - the K-Jetronic and its operation should be clearly understood. The essential points of the operation and construction of the K-Jetronic are described in Technical Instruction VDT-U 3/1 En.

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B 2 - B 5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specification.

Important note:

If any fuel connections are loosened, parts removed, also on the vacuum system, always use new seals when re-connecting or re-installing.

Ensure utmost cleanliness when working on the K-Jetronic. Fuel connections must be cleaned thoroughly on the outside before opening.

4.2 Design of K-Jetronic

The entire system of the K-Jetronic in Volvo engines B 20... corresponds to the basic design as described in Technical Instruction VDT-U 3/1.

It should be noted that fuel distributor 0 438 100 003 and warm-up regulator 0 438 140 002 (1974 model) are still equipped with rigidly pressed-in tailpieces for the fuel lines. The polyamide fuel lines are rigidly pressed onto the tailpieces. In case of replacement, only 0 438 100 005 and 0 438 140 004 of the 1975 model (with the now customary screw connections) are available. In order, in such cases, to prevent having at the same time to replace several fuel lines, the new fuel distributors are to be installed with corresponding connecting-parts sets. Part numbers of the parts sets:

Fuel distributor:	2 437 001 001
Warm-up regulator:	1 437 000 000

4.3 Electrical safety circuit:

The electrical components of the K-Jectronic are energized via a circuit with control and switching relays whereby the stop leaf spring for the air-flow sensor plate rest position serves as switching contact for the control relay. Electric fuel pump, warm-up regulator and auxiliary-air device are supplied with power when the starting motor is operated and/or when the air-flow sensor contact is open.

In order to switch on the electric fuel pump for testing operations with the engine stopped, it is sufficient to remove the plug from the air-flow sensor and to switch on the ignition.

4.4 Other equipment:

The USA model 1975 (engine B 20 F) is equipped with secondary-air pump and exhaust-gas recirculation, the California model being supplied with an additional catalytic converter. The possible influence of these components should be borne in mind when trouble-shooting and when performing the idle adjustment.

5. Test equipment and tools

- Pressure tester KDJE-P 100 (previously KDEP 1034)

  For testing all fuel pressures and testing for leaks.

- Adjusting wrench KDEP 1035

  For adjusting the idle-mixture-adjusting screw in the mixture-control unit (CO-adjustment).

- Guide ring KDEP 1040/10 (dia. 80 mm)

  For centering the air-flow sensor plate in the air-flow sensor.

- Tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451)

  For comparing the fuel delivered from the individual fuel-distributor outlets.

- Electric connecting cable (test lead)

  KDJE 7450/70 for the direct connection of components to be tested, e.g. cold-start valve.

- Graduate (commercially available, capacity approx. 1.5 l)

For measuring the delivery of the electric fuel pump.

- Valve tester KDJE-P 400 (previously KDJE 7452).

For testing the injection valves.

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part Designation 14 942-CH
Previousl, Part No. 5 973 340 650
The Bosch calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH & Co.
D-7531 Kämpfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

- Tachometer (commercially available)

For idle-speed adjustment

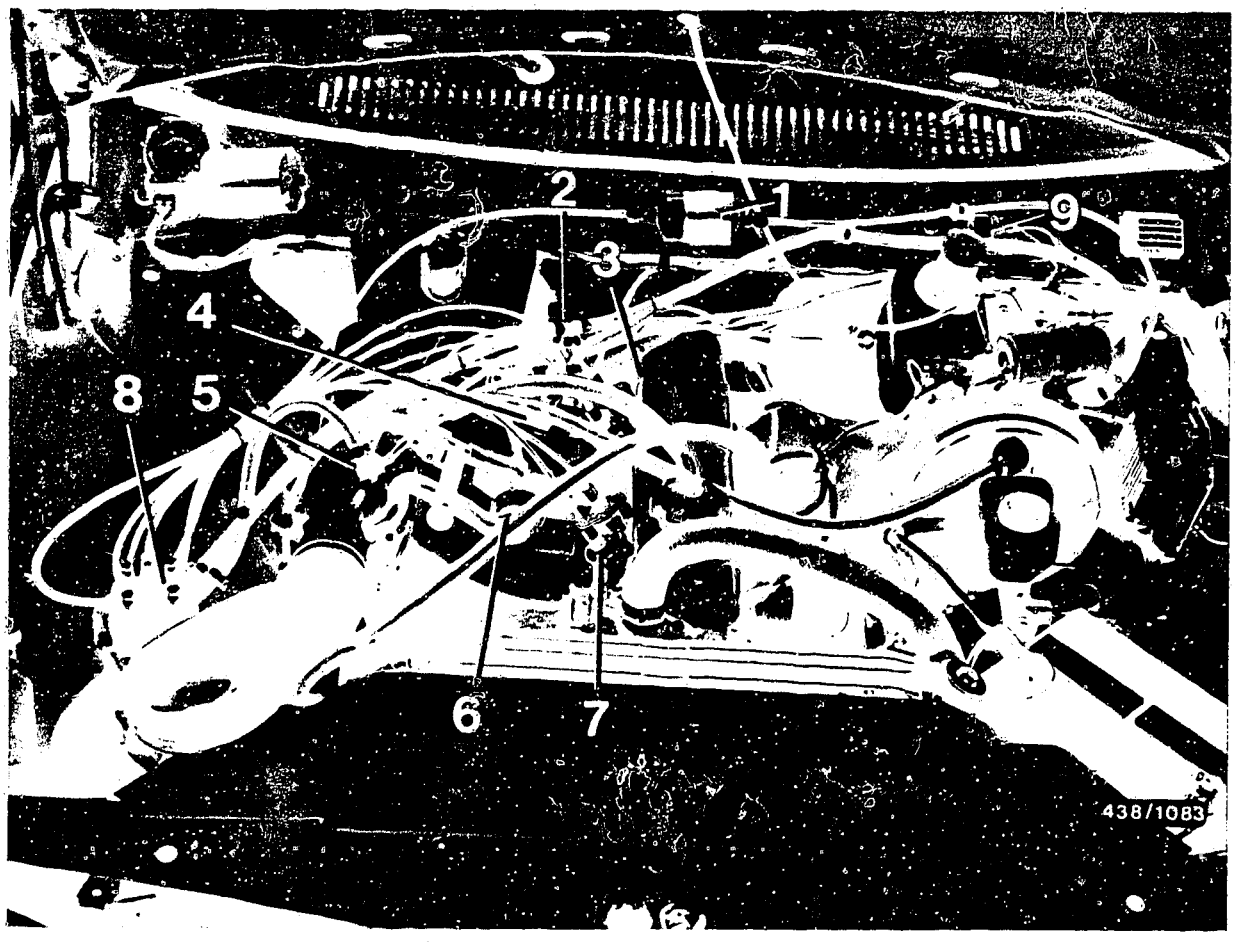
- CO meter (commercially available)

For idle-speed CO adjustment.

- Set of tools for the removal and fitting of idle-CO-anti-tamper device of air-flow sensor.
  (e.g. No. 4521/7 from the firm Hazet, D-5630 Remscheid).

- Assembly tool KDEP 1039

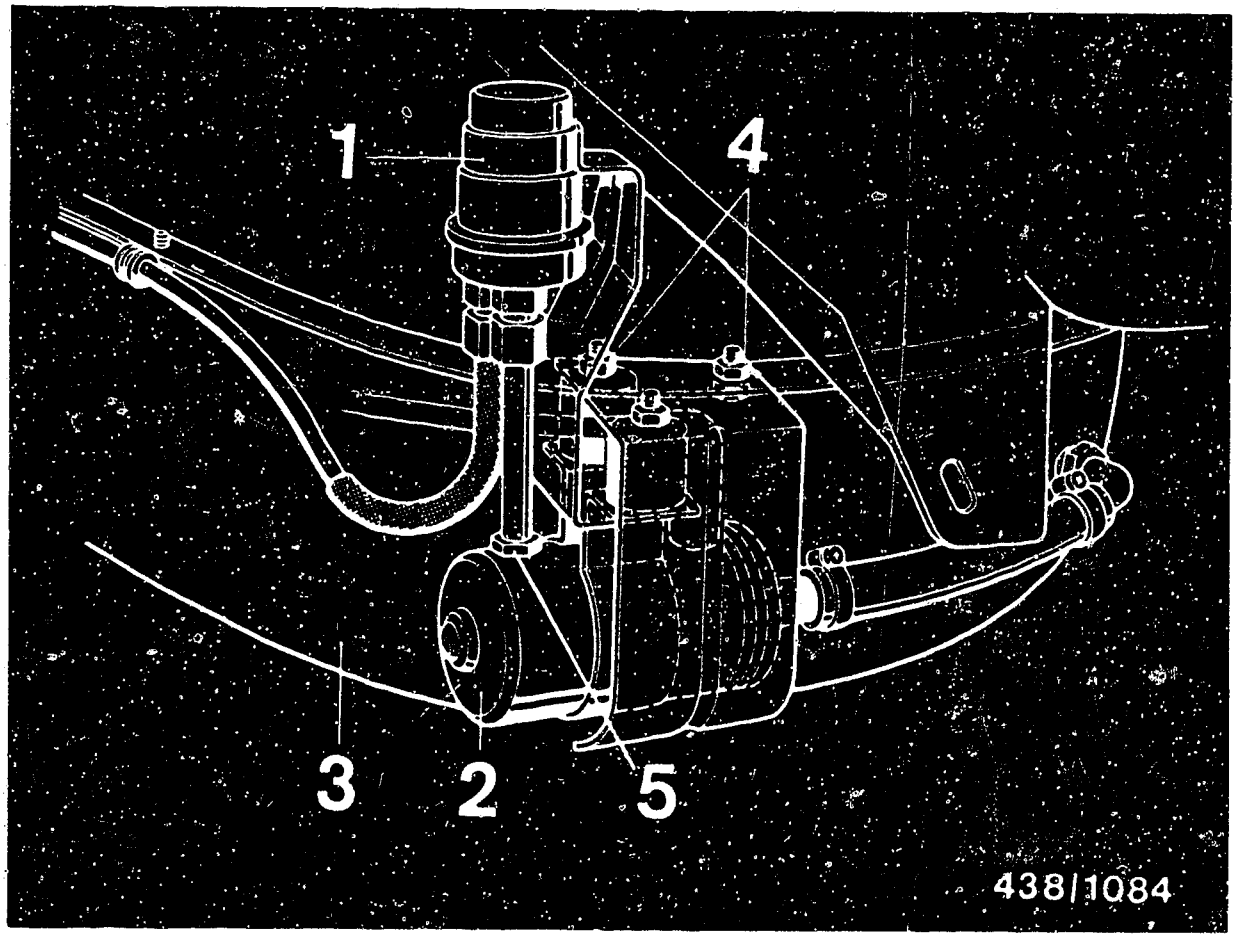
  For fitting the Polyamide hose lines onto the fixed tailpieces of fuel distributor and warm-up regulator of 1974 model.



6. Installation position of individual components

6.1 Arrangement of components on engine (vehicle type 144)

1 = Fuel filter
2 = T-piece in fuel return
3 = Thermo-time switch (in engine block, concealed by intake manifold)
4 = Warm-up regulator
5 = Start valve
6 = Auxiliary-air device
7 = Injection valves
8 = Mixture-control unit
9 = Relay for electrical safety circuit



1 = Fuel accumulator
2 = Electric fuel pump
3 = Fuel tank
4 = Fastening nuts of bracket
5 = Delivery fitting

6.2 Fuel-supply components

On both model series, the electric fuel pump and fuel accumulator are on a bracket which is mounted under the luggage compartment floor, on the left-hand side in the forward direction of travel, next to the fuel tank.

7. Trouble-shooting chart

When trouble-shooting the K-Jetronic, it is assumed that the ignition is in order and that the engine is in proper mechanical condition.

The individual test steps of this repair manual are detailed and self-contained. This permits direct trouble-shooting without having to go through the entire test program for each fault.

The trouble-shooting chart on Coordinates B2 - B5 is intended to make it easier to decide which test steps have to be carried out for certain faults.

According to the symptom stated by the customer or which you yourself have determined, select the possible cause in the trouble-shooting chart. The coordinate at the end of the cause column refers to the appropriate test step with the associated test specifications.

Trouble-shooting chart

Customer complaint (fault symptom)

1. Engine does not start, or starts poorly, in cold condition
2. Engine does not start, or starts poorly, in warm condition*
3. Irregular idling during the warm-up phase (shakes)
4. Irregular idling with warm engine (shakes)
5. Engine does not draw gas, burbles
6. Engine misfires when operating on the road, high load
7. Insufficient power

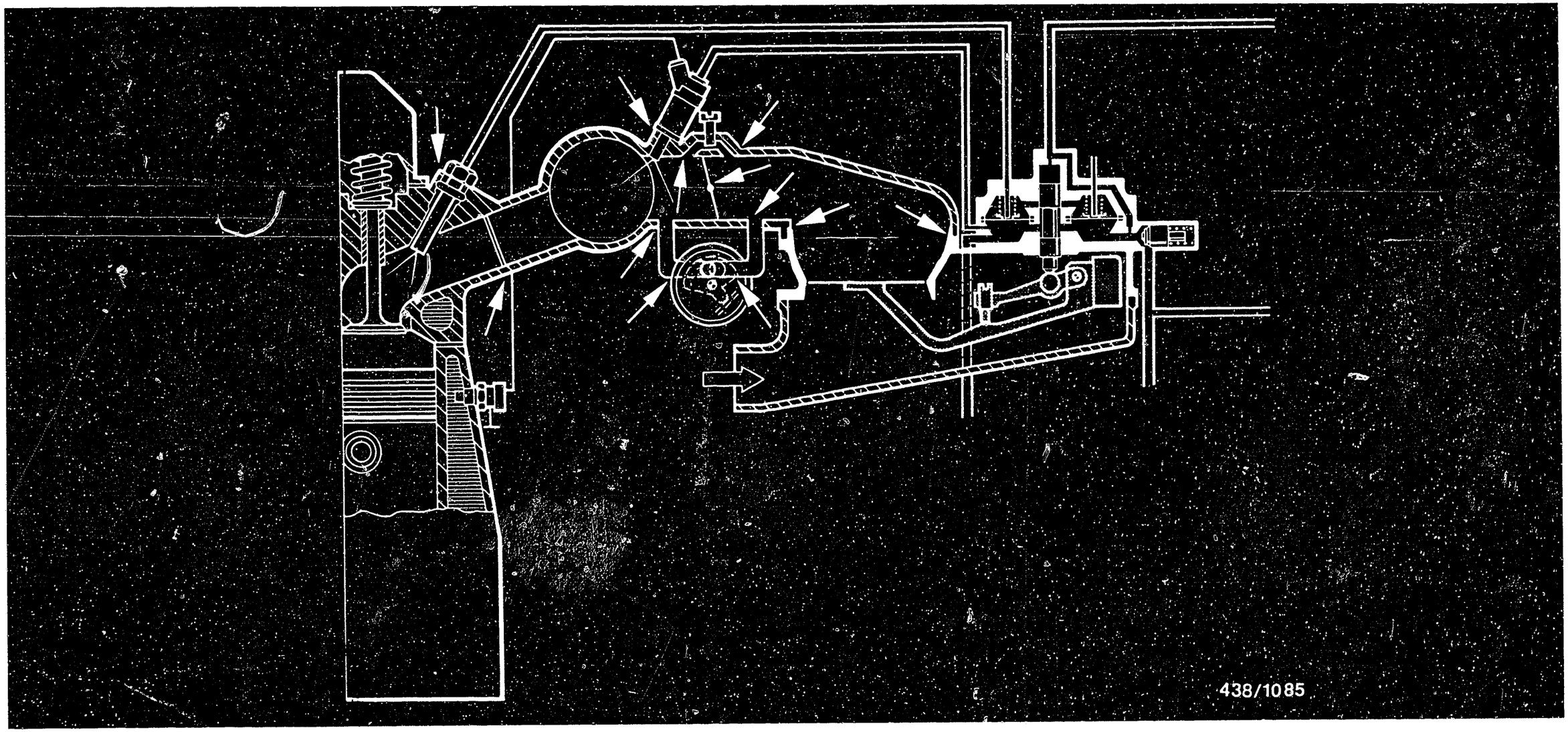
1	2	3	4	5	6	7	Cause	Coordinate
	●	●	●	●		●	Vacuum system leaking	B 5
●	●		●	●	●	●	Air-flow sensor lever and/or control plunger not moving smoothly	B 7
	●						Position of the air-flow sensor plate incorrect	B 18
●		●					Auxiliary-air device does not open	C 2
●	●				●		Electric fuel pump not operating	C 5
●							Cold-start system defective	C 17
		●	●				Cold-start valve leaking	C 20
				●			Excessive fuel delivery for control-pressure circuit	C 24
●		●					"Cold" control pressure outside tolerance	C 22
	●		●	●	●	●	"Warm" control pressure too high (after warm-up)	C 22
			●	●		●	"Warm" control pressure too low (after warm-up)	C 22
					●	●	Primary (system) pressure outside tolerance	D 15
	●						Overall fuel system leaking	D 23
●	●	●	●		●		Injection valves leaking, opening pressure too low	E 22
●	●	●	●			●	Unequal fuel delivery (imbalance of fuel delivery)	F 10
●	●	●	●	●			Basic idle adjustment incorrect	F 23
						●	Throttle plate does not open completely	----

*Note:
If, in the case of Symptom 2, after checking and repairing all the fault causes listed below, the hot-start characteristic is still unsatisfactory this can be improved by fitting an impulse relay.
The fitting of this relay is described in Coordinates L 5.

Trouble-shooting chart (continued)

Customer complaint (fault symptom)

8. Engine runs on after being switched off ("diesels")	9. Fuel consumption too high	10. Flat spot during acceleration	11. CO concentration during idling too high	12. CO concentration during idling too low	13. Idle-speed cannot be adjusted (too high)	14. Engine starts but then immediately stops	Cause	Coordinate
		●		●			Vacuum system leaking	B 5
●		●	●	●			Air-flow sensor and/or control plunger not moving smoothly	B 7
●							Position of the air-flow sensor plate incorrect	B 17
							Auxiliary-air device does not open	B 21
					●		Auxiliary-air device does not close	B 21
						●	Electric fuel pump not operating	C 1
							Cold-start system defective	C 7
●	●		●				Cold-start valve leaking	C 10
		●				●	Excessive fuel delivery for control-pressure circuit	C 15
		●				●	"Warm" control pressure too high (after warm-up)	D 1
	●	●	●			●	"Warm" control pressure too low (after warm-up)	D 1
		●				●	Primary (system) pressure outside tolerance	D 9
							Overall fuel system leaking	D 17
●							Injection valves leaking, opening pressure too low	E 10
		●					Unequal fuel delivery (imbalance of fuel delivery)	E 22
●	●	●	●	●			Basic idle adjustment incorrect	F 6
							Throttle plate does not open completely	E 24



Working steps

8. Check the air-intake system of the engine for leaks.

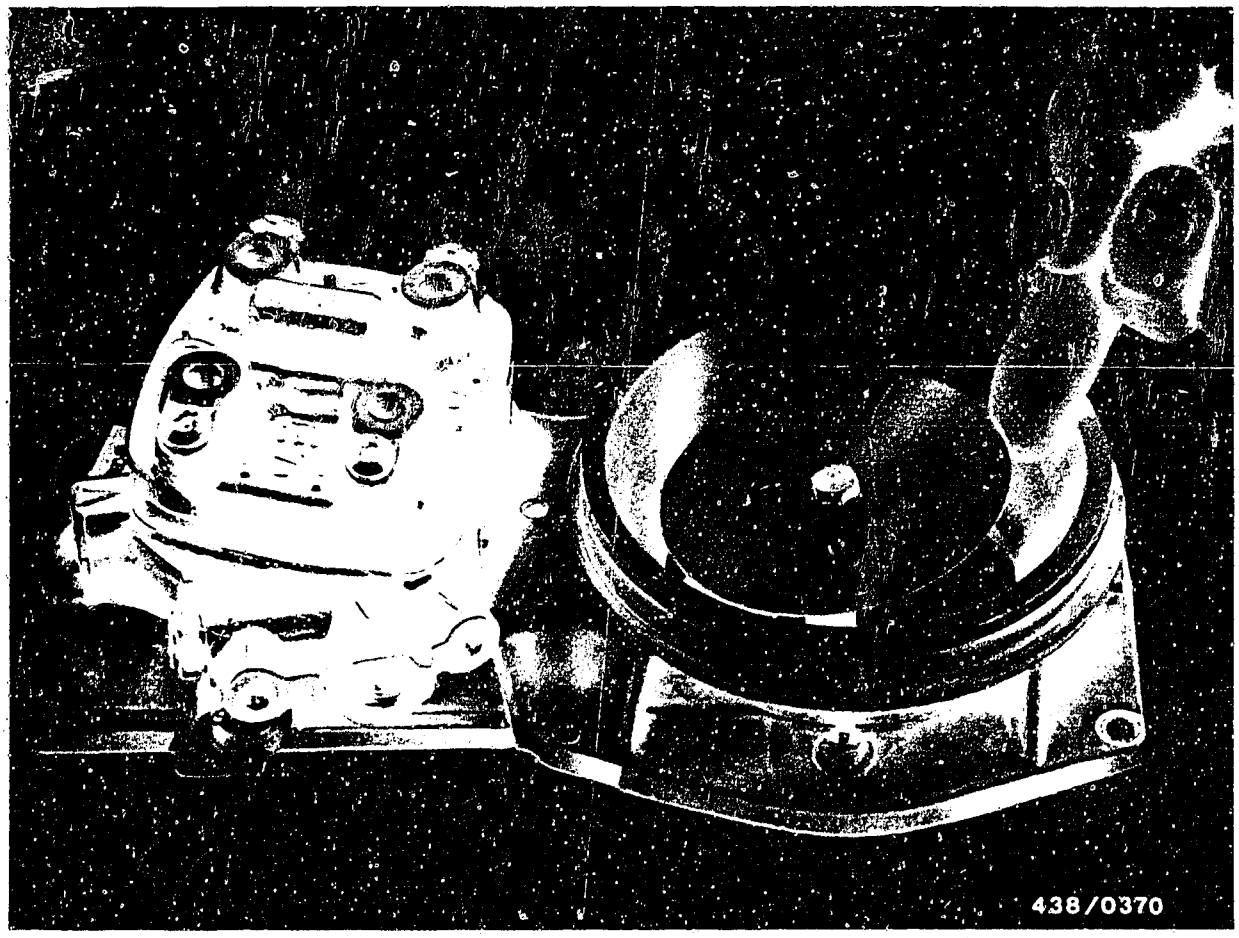
The arrows in the diagram show typical points where leaks can occur.
Check by performing a visual inspection or, in cases of doubt, as follows: Disconnect the hose from the outlet of the auxiliary-air device and blow air through this hose into the intake system using a compressed-air gun. The throttle valve is to be fully open. Brush connection points with soapy water, or spray with leak detector (e.g. Güpoflex).

Under no circumstances may combustible liquids be used when testing for leaks.
The formation of bubbles or foam indicates a leak.
If a leak has been eliminated, it is necessary finally to adjust the idle speed with the engine at normal operating temperature:
Idle-speed adjustment is described on Coordinates F 6.

9. Check the control lever in the air-flow sensor and the control plunger in the fuel distributor for ease of movement.

9.1 Preparations

- Engine temperature not below +20°C.
- Remove the rubber hood so that the air-flow sensor plate becomes accessible.
- Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
  This results in application of the control pressure to the control plunger in the fuel distributor.



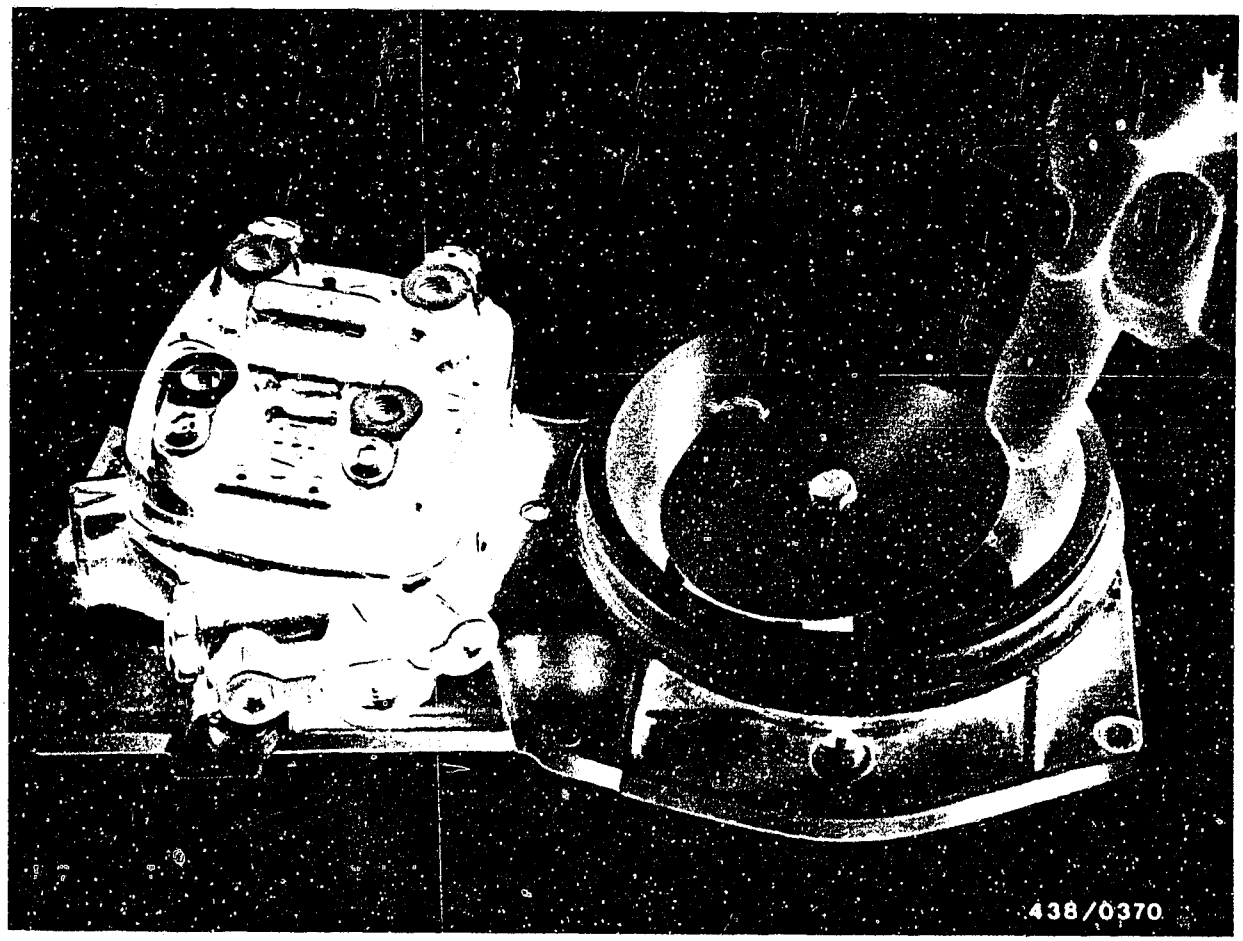
9.2 Check that the control lever moves freely

Raise the air-flow sensor plate by hand (updraft) and release again. The sensor plate snaps back into the zero position and bounces up about twice from the spring-loaded stop. If the control lever does not move freely, first release all fastening screws holding the air-flow sensor to determine whether housing deformation is the cause of the problem.

If, with fastening screws loosened, the control lever moves freely, replace the seal between air filter and air-flow sensor (Volvo service part).

Tighten the screws uniformly cross-wise to a torque of 9...10 Nm (0.9...1.0 kgfm).

If the housing is not deformed, then the air-flow sensor must be repaired or replaced.



9.3 Check that the control plunger moves freely

Raise the air-flow sensor plate by hand (updraft). The same resistance must be felt over the entire movement.

Move the sensor plate rapidly back to a position just in front of the zero stop. The control plunger follows only sluggishly, but must make noticeable contact with the sensor plate lever. If this condition is fulfilled, the control plunger can be considered to move freely.

If the control plunger does not move freely, remove the fuel distributor from the air-flow sensor.

Important!

Note the following when installing fuel components and fuel lines:

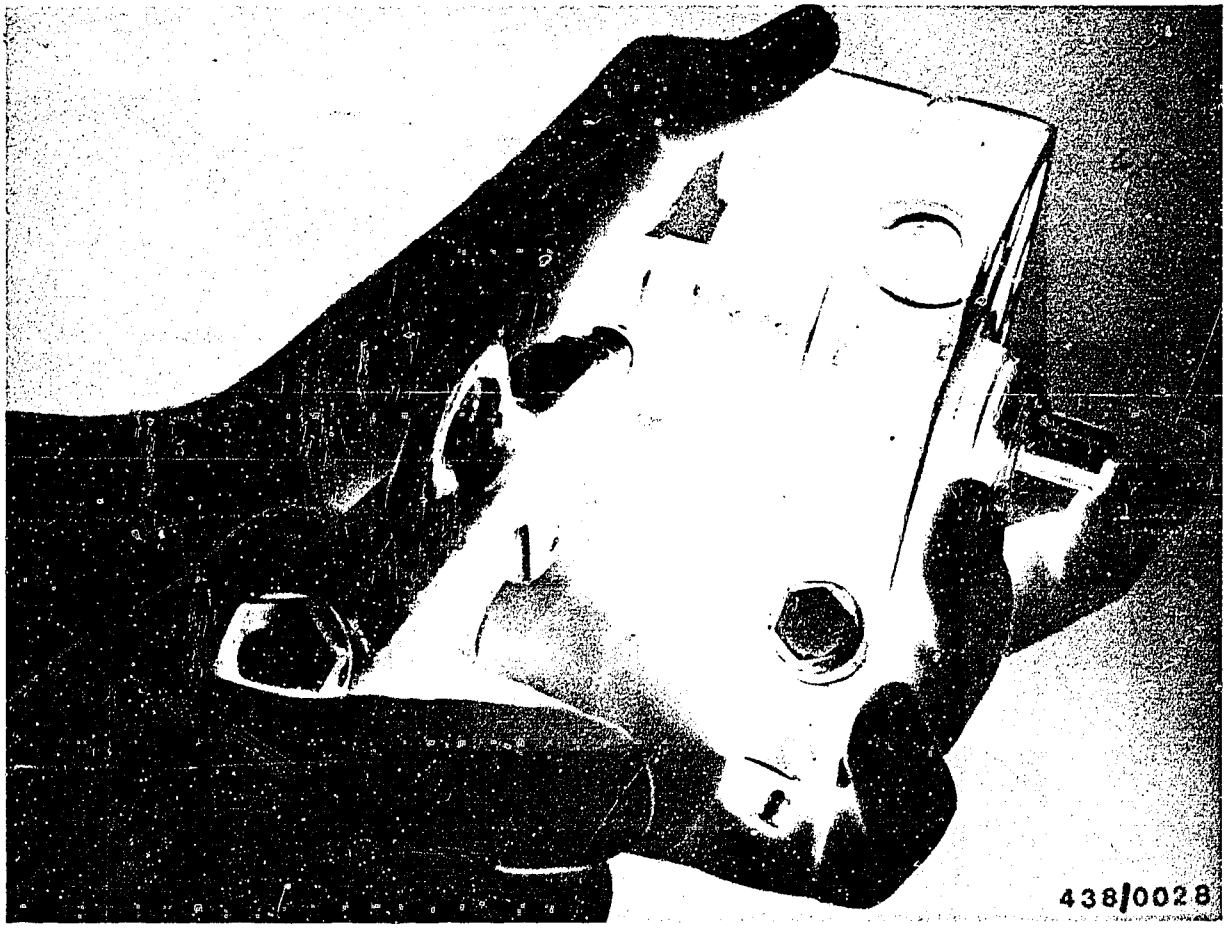
Always ensure utmost cleanliness when loosening or tightening the fuel connections. No dirt must enter the fuel system.

When loosening or tightening the fuel connections, apply counter-force at the fixed hexagon of the component.

Clean the fuel distributor thoroughly in the region of the fuel connections. Screw off all connections.

On the 1974 model the fixed line for fuel inlet should for the time being be left on the fuel distributor.

Unscrew the three fastening screws of the fuel distributor and remove the fuel distributor from the air-flow sensor.



Remove the plunger. Under certain conditions, in order to do this it may be necessary to blow compressed air briefly against the plunger through the control-pressure connection hole. Hold the plunger with your hand while doing this. Clean the plunger thoroughly with benzine. If the plunger still does not move freely, replace the fuel distributor

Note on replacing the fuel inlet line on fuel distributor 0 438 100 003 of the 1974 model (Type 140..)

Using a soldering iron, cut open the fuel line in the area of the fitting and pull off.

Caution: Never use an open flame for heating the line. Danger of fire!

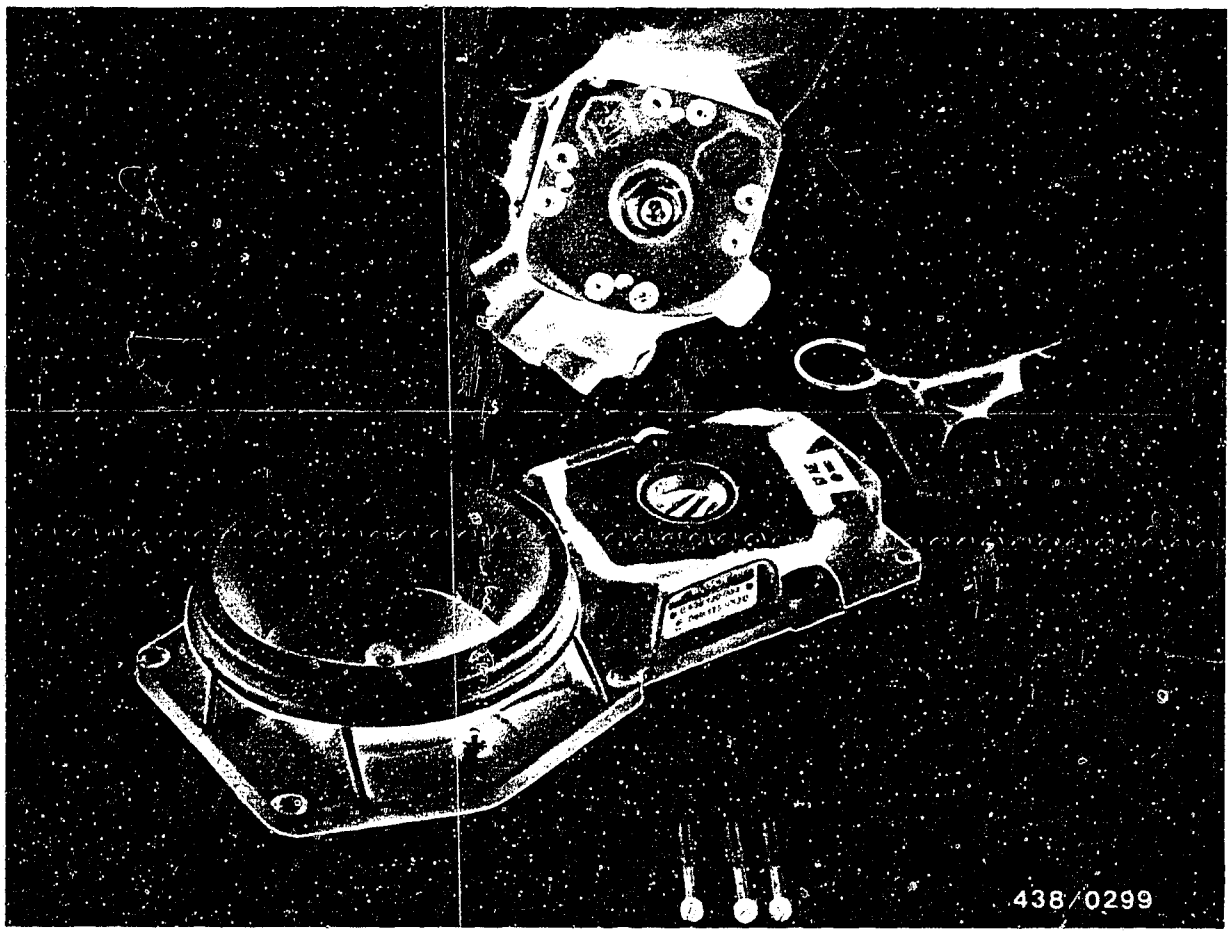
Cutting the line open with a knife is likewise not advisable if only the line is to be replaced and if the fuel distributor is to be used again. The tooth section of the fitting would be damaged, which may lead subsequently to leaks.

Mounting the line:

Cut off the section of the line which has been cut open.

Insert the line into assembly tool KDEP 1039 so that it projects by the amount of the length of the fitting.

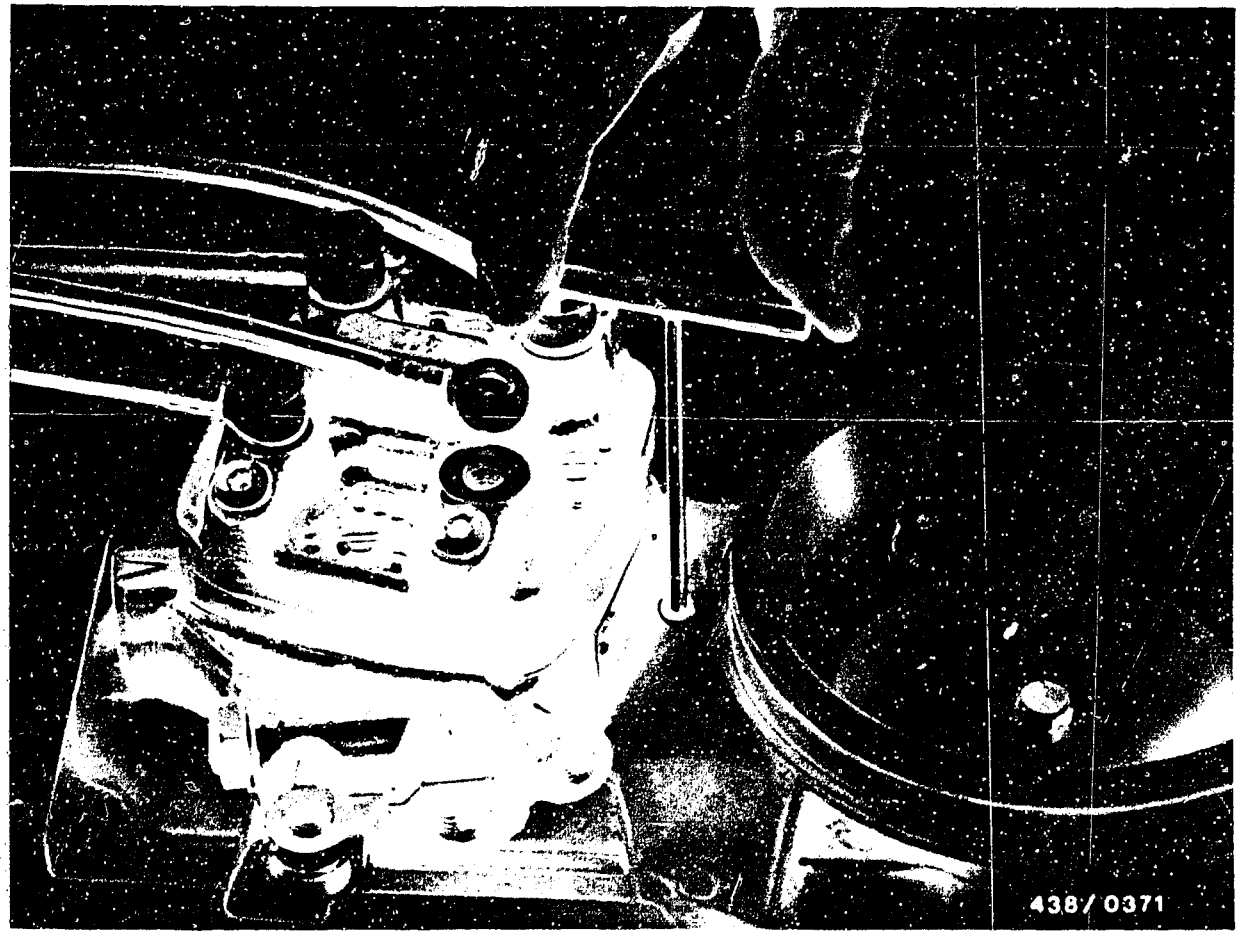
Press the line cold onto the fitting.
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which will lead subsequently to leaking.



9.4 Fitting the fuel distributor

When fitting the fuel distributor, use a new seal ring between fuel distributor and air-flow sensor. Observe the tightening torque 3.2...3.8 Nm (0.32... 0.38 kgfm) for the fastening screws precisely.

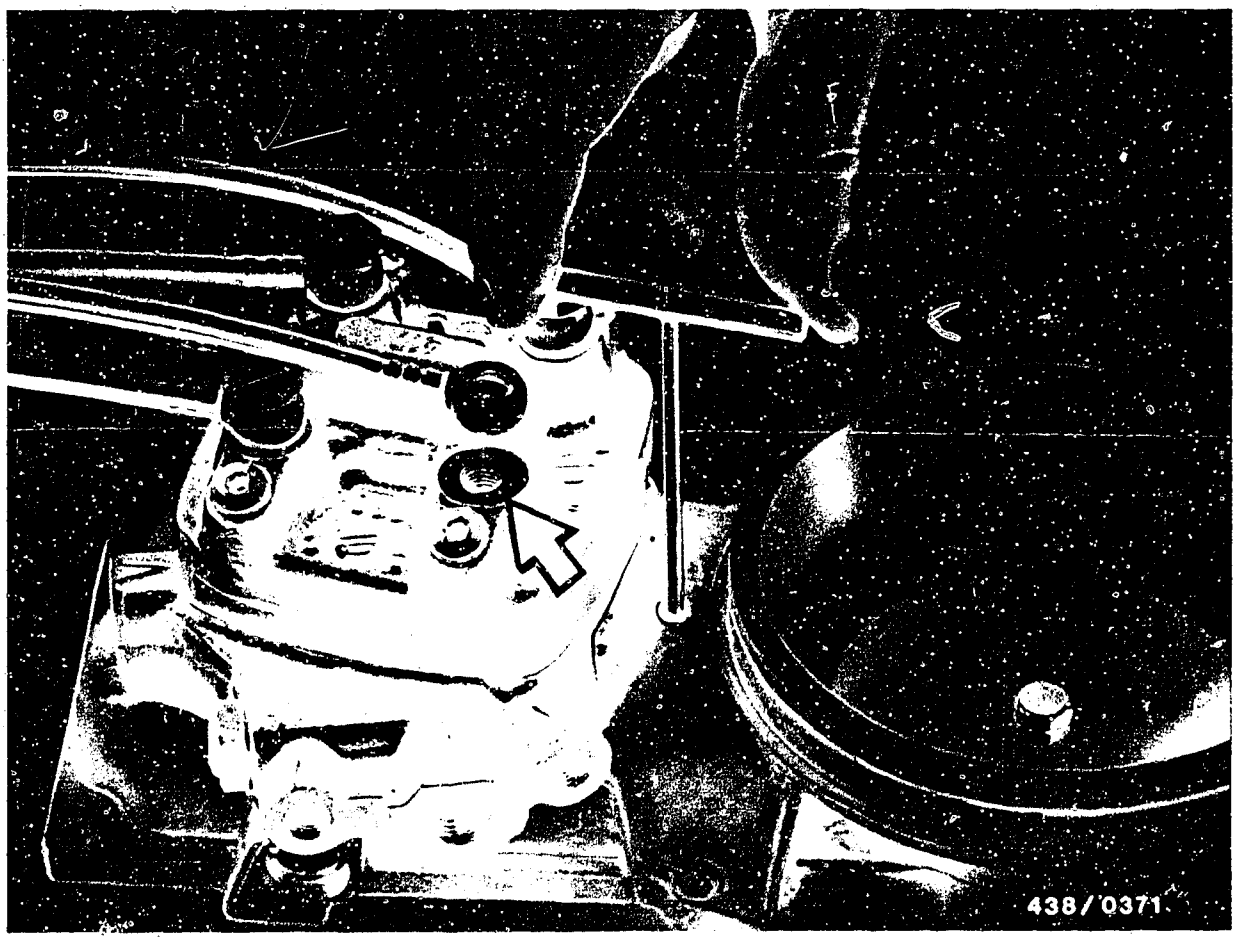
When connecting the fuel-injection tubing, use new seal rings.



9.5 Matching the fuel distributor to the air-flow sensor for initial starting:

Unscrew one injection line from the fuel distributor. Bridge the electrical safety circuit so that the electric fuel pump operates.

Remove the rubber plug from the access bore to the idle-mixture-adjusting screw in the air-flow sensor. Insert adjusting wrench KDEP 1035 through the bore into the idle-mixture-adjusting screw.

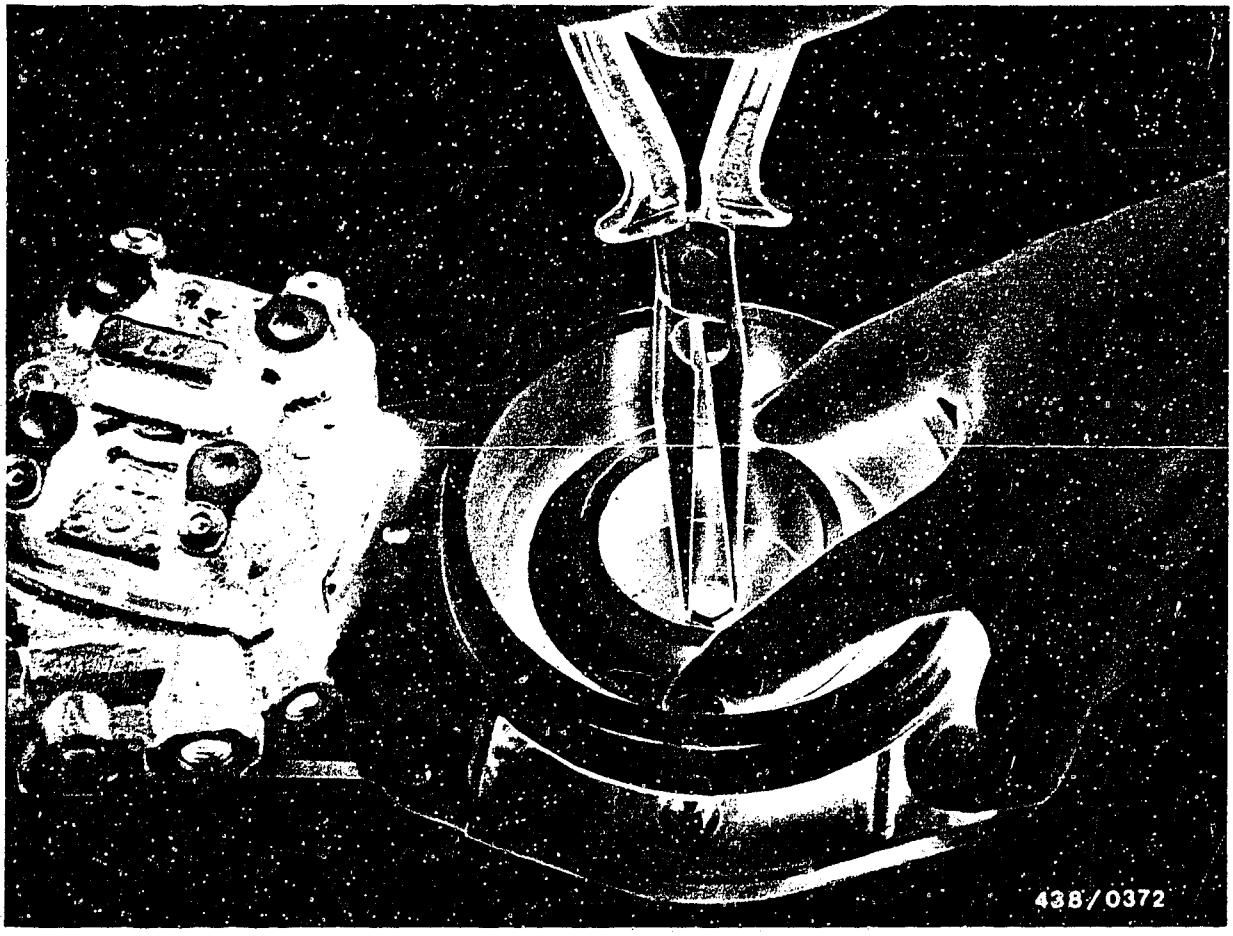


Screw in the idle-mixture-adjusting screw slowly and without exerting any great pressure on the adjusting wrench until fuel is just delivered from the open outlet (arrow) of the fuel distributor. Then turn back the idle-mixture screw by 1/2 turn.

Re-connect the fuel-injection line to the fuel distributor, start the engine and warm up.

The final matching of air-flow sensor and fuel distributor is carried out by adjusting the idle speed with the engine at normal operating temperature.

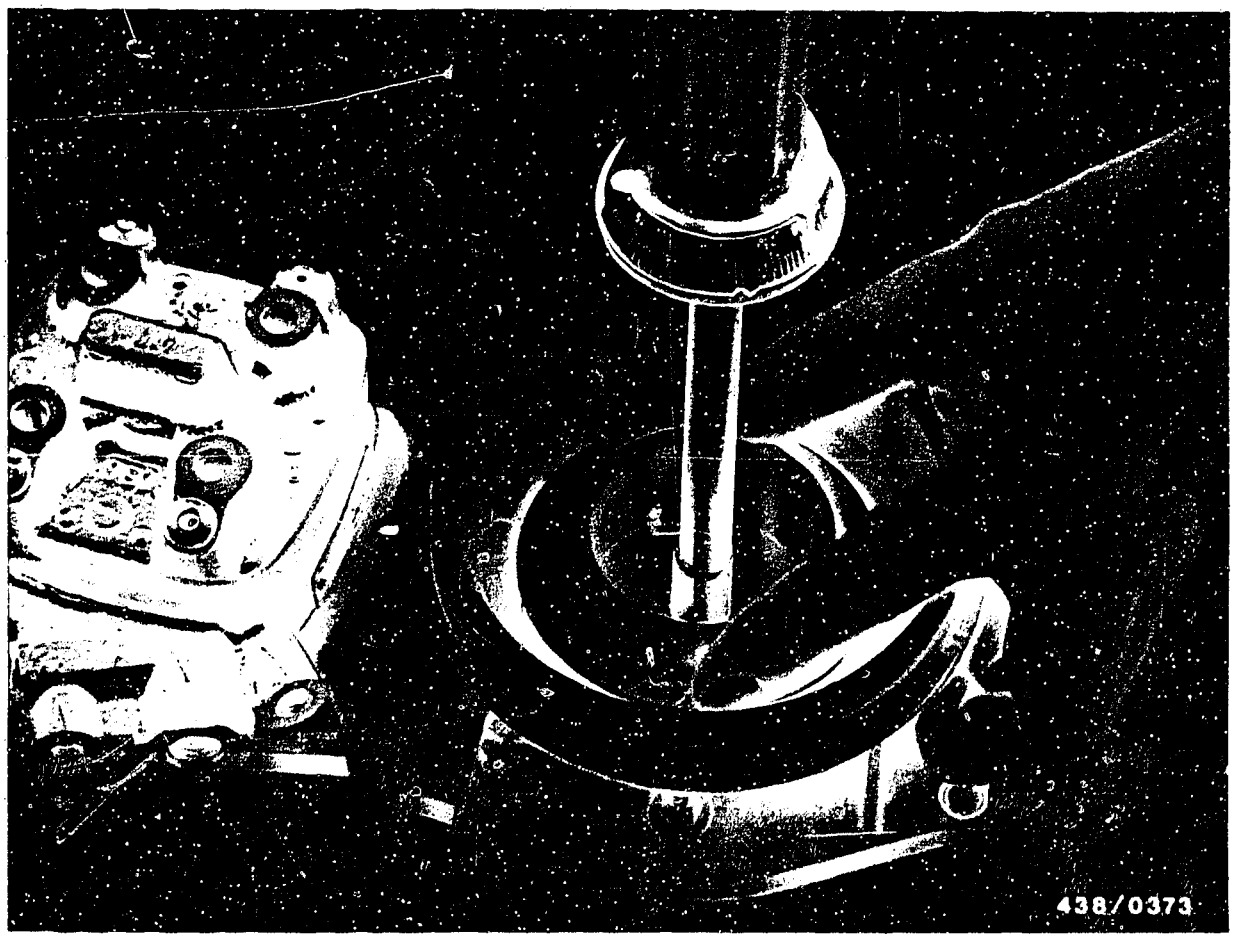
Idle-speed adjustment is described on Coordinates F 6.



10.2 Centering the air-flow sensor plate

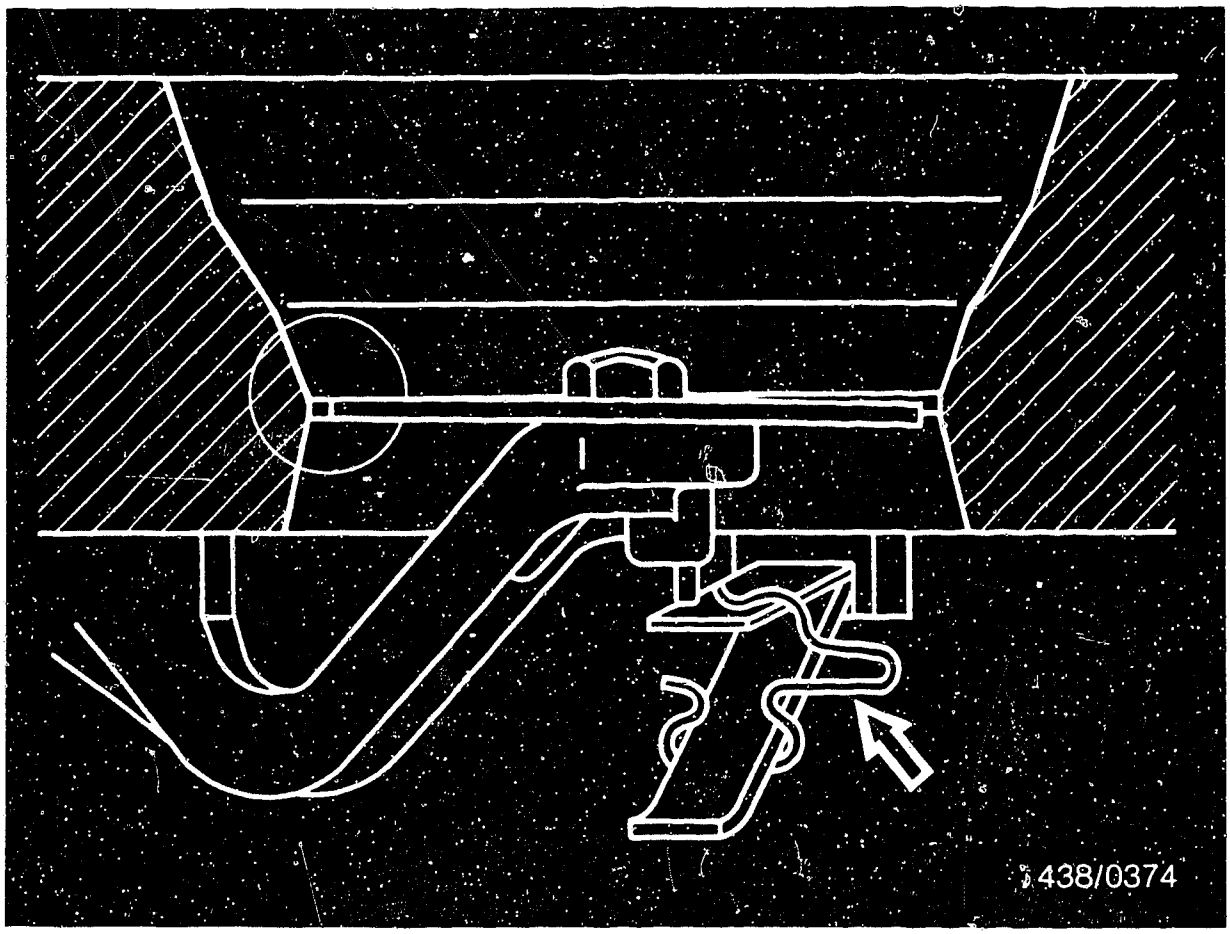
Check that the sensor plate is flat (not bent) and that it can move through the narrowest part of the air funnel without touching the funnel. If necessary, center it using a positioning ring KDEP 1040/10 (dia. 80 mm) as follows:

Loosen the sensor plate fastening screw. Insert the positioning ring while holding the fastening screw with pliers so that the sensor plate does not deflect downwards.



With the positioning ring in place, tighten the fastening screw with a torque of 5.0...5.5 Nm, loosen again and tighten again with the same torque.
When tightening the screw make sure that the air-flow sensor plate is in its zero position (in the cylindrical part of the air funnel).

It must no longer be possible to turn the air-flow sensor plate by hand.

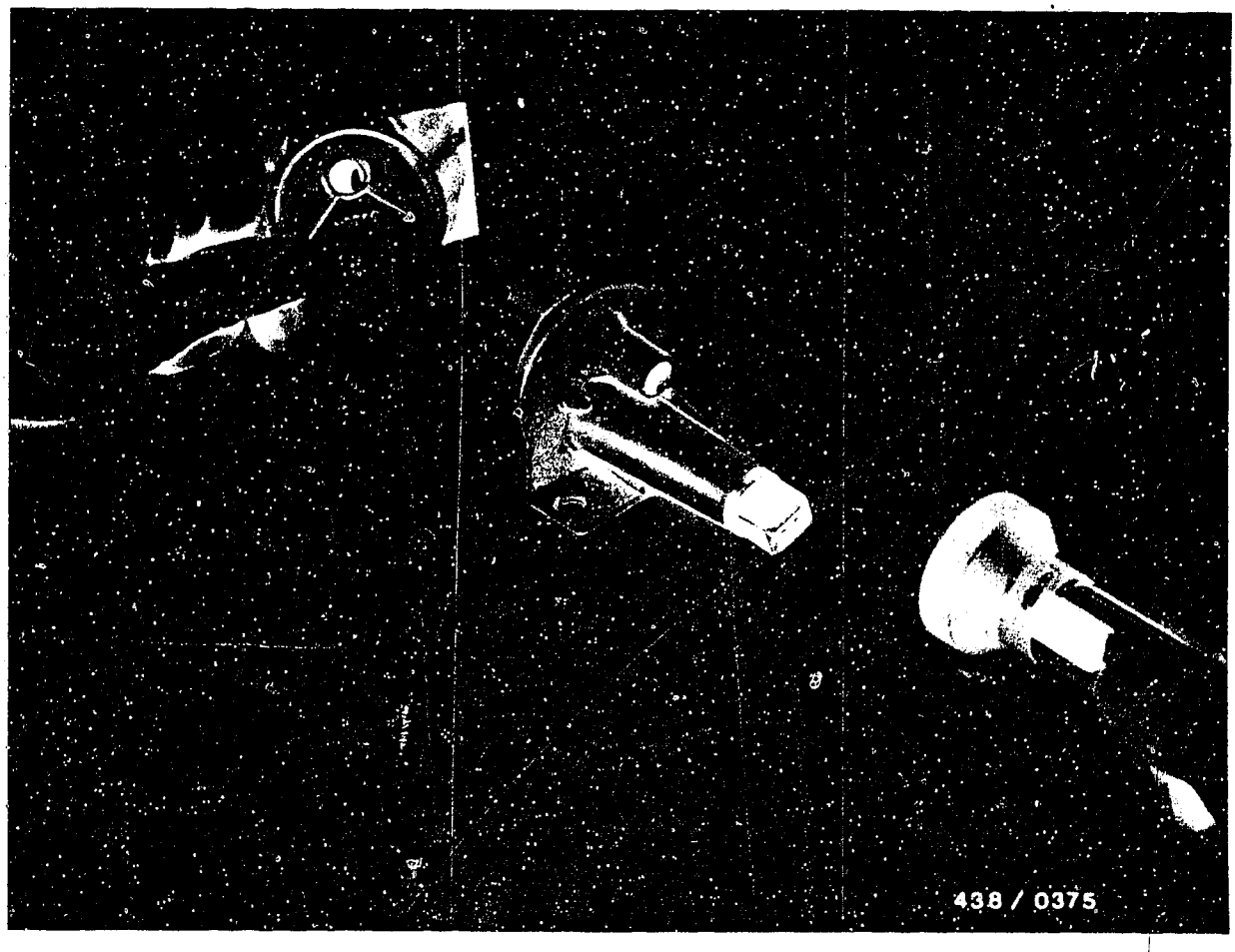


10.3 Checking and adjusting the zero position of the sensor plate (rest position):

Switch on the electric fuel pump for approx. 10 seconds by bridging the safety circuit.
This results in application of the control pressure to the control plunger in the fuel distributor.

The upper edge of the sensor plate must be flush with the cone in the position marked with a circle in the picture. A lower position of up to maximum 0.5 mm is permissible, however the air-flow sensor plate must not project at any point on its circumference outside the cylindrical part of the air funnel.

If necessary, the position of the leaf-spring limit-stop can be corrected by adjusting the shaped spring (arrow).



1 = Auxiliary-air device
2 = Flashlight
3 = Mirror

11. Checking the operation of the auxiliary-air device.

The engine must be cold.
Disconnect the electric cable plugs from the auxiliary-air device and warm-up regulator.
Disconnect both air hoses from the auxiliary-air device.
Since the two hose fittings on the auxiliary-air device are located exactly opposite each other, a visual check can now be made to see if the blocking plate is partially open.
It will be easier to look through the auxiliary-air device with the aid of a flashlight and a mirror, as shown in the illustration.

- If an opening is not visible with the engine cold, replace the auxiliary-air device.

- Fit the electric cable plug on the auxiliary-air device.

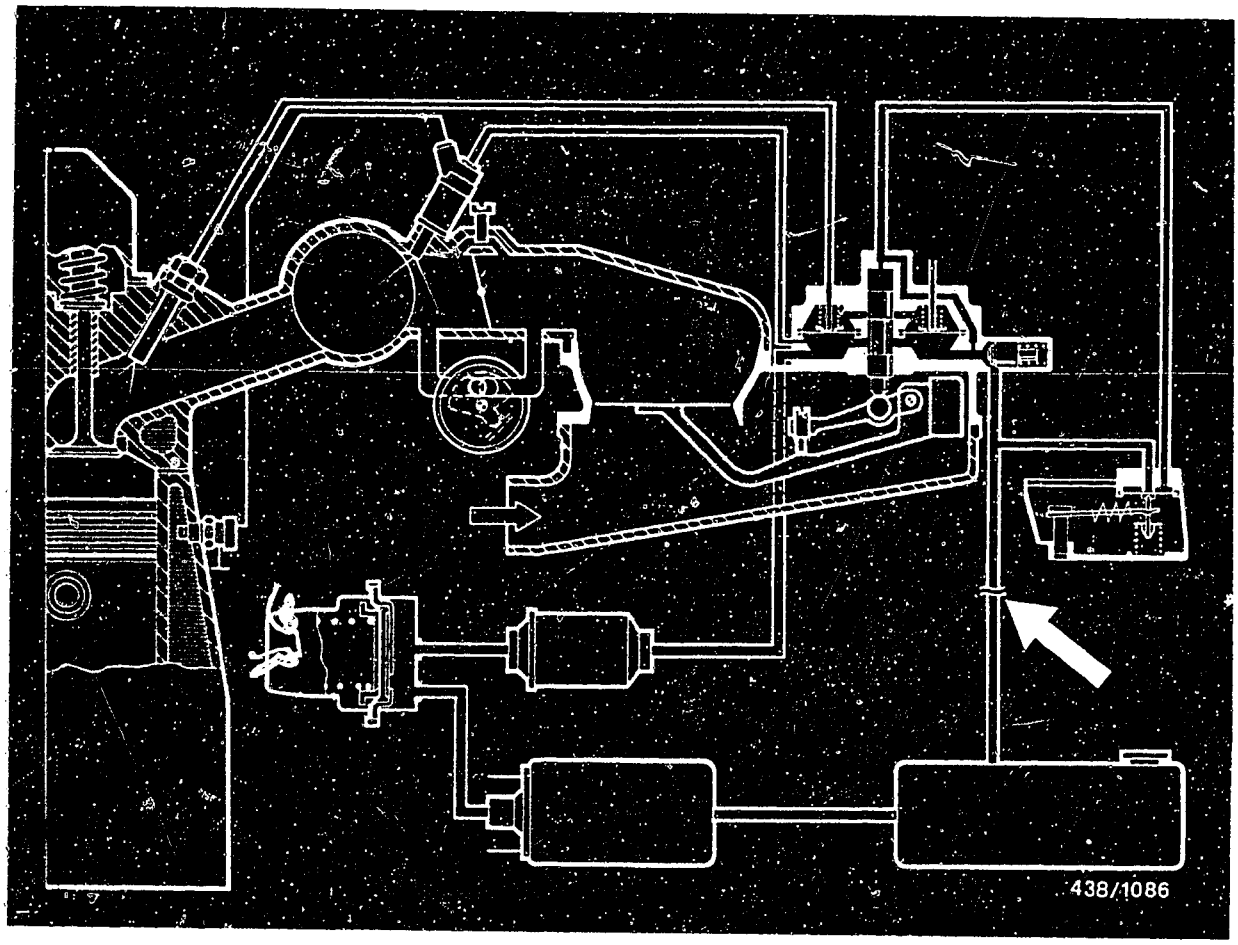
- By bridging the electrical safety circuit, supply power to the auxiliary-air device.
  After a maximum of 10 minutes, the opening in the auxiliary-air device must be completely closed by the blocking plate.

- If the blocking plate does not close, check the power supply (open circuit, voltage drop).
  Minimum voltage across the connector 11.5 V with the engine stopped.

- If these points are O.K., check the heating coil of the auxiliary-air device for an open circuit using an ohmmeter.

- Replace the auxiliary-air device if defective.

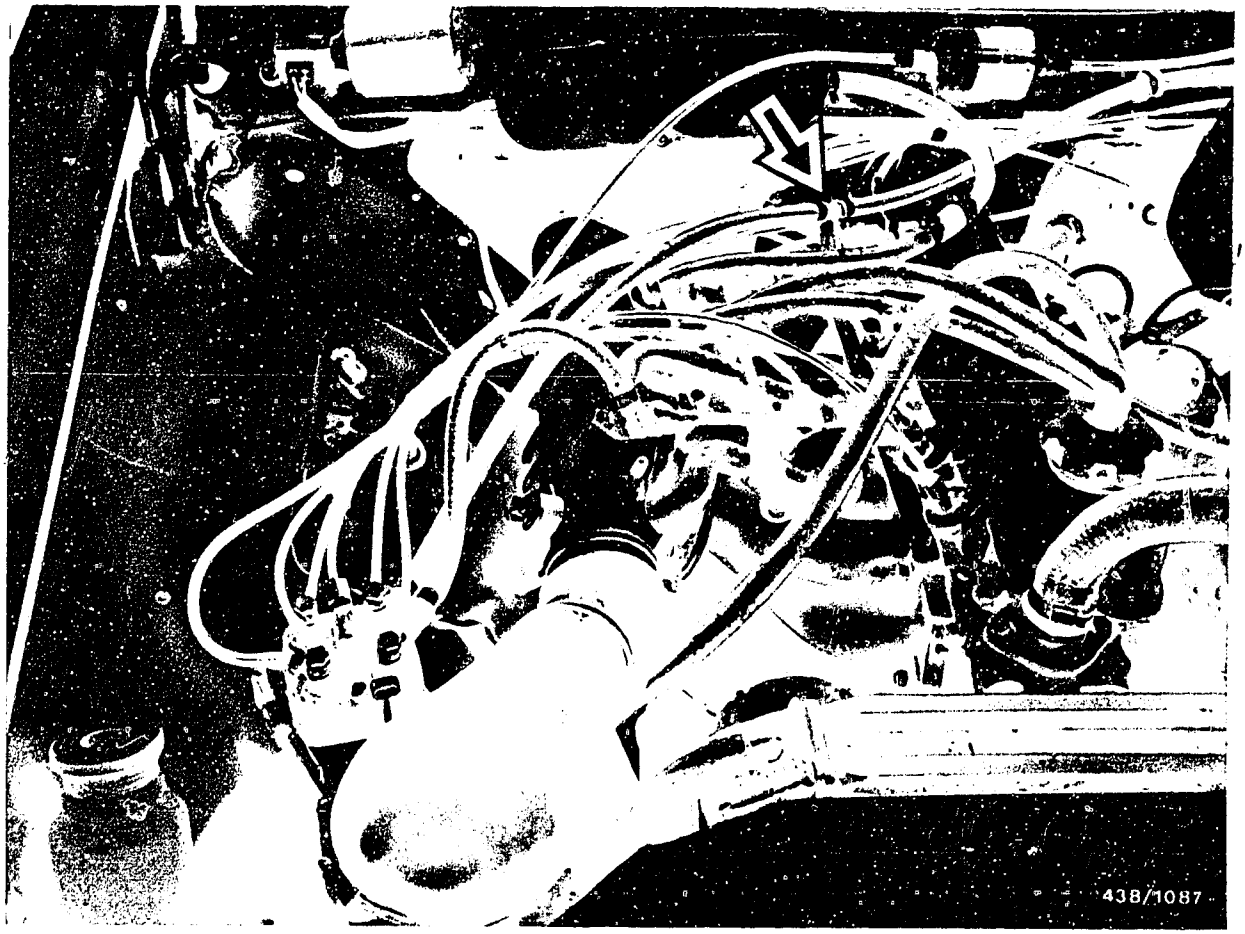
When the auxiliary-air device has been replaced, readjust the idle speed with the engine at normal operating temperature. Idle adjustment is described on Coordinates F 6.



12. Checking the operation of the electric fuel pump

12.1 Requirement:

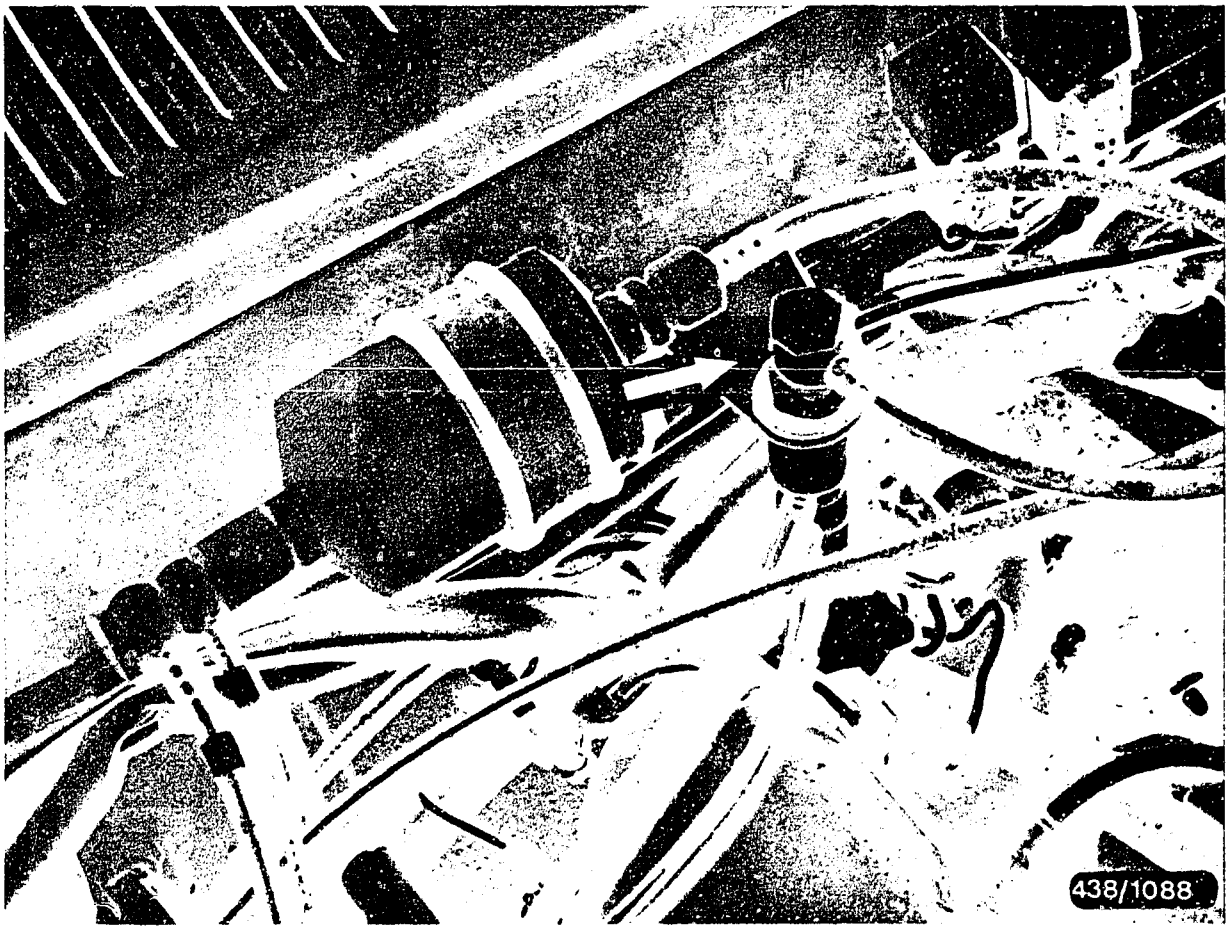
Conclusive information on the operation of the electric fuel pump can only be given by a measurement of fuel delivery under pressure, i.e. under primary (system) pressure. This measurement must therefore be made at the return line leading to the fuel tank, after the return lines from primary-pressure regulator and warm-up regulator have come together.



12.2 Measuring point:

A suitable measuring point on the 1974 model (Type 140..) is the outlet of the T-piece in the return line (arrow).

Remove return line from T-piece outlet and connect test line to T-piece.



On the 1975 model (Type 240..) there is a return collector piece on a mounting bracket to the right of the fuel filter (arrow).

Unscrew the upper inlet-union screw. Equip a test hose with inlet union (12 mm diameter) and connect to collector piece.

12.3 Checking

Pull off the plug from the warm-up regulator. Switch on the electric fuel pump for 30 seconds by bridging the safety circuit and collect the fuel delivered in the graduate.

12.4 Test specification

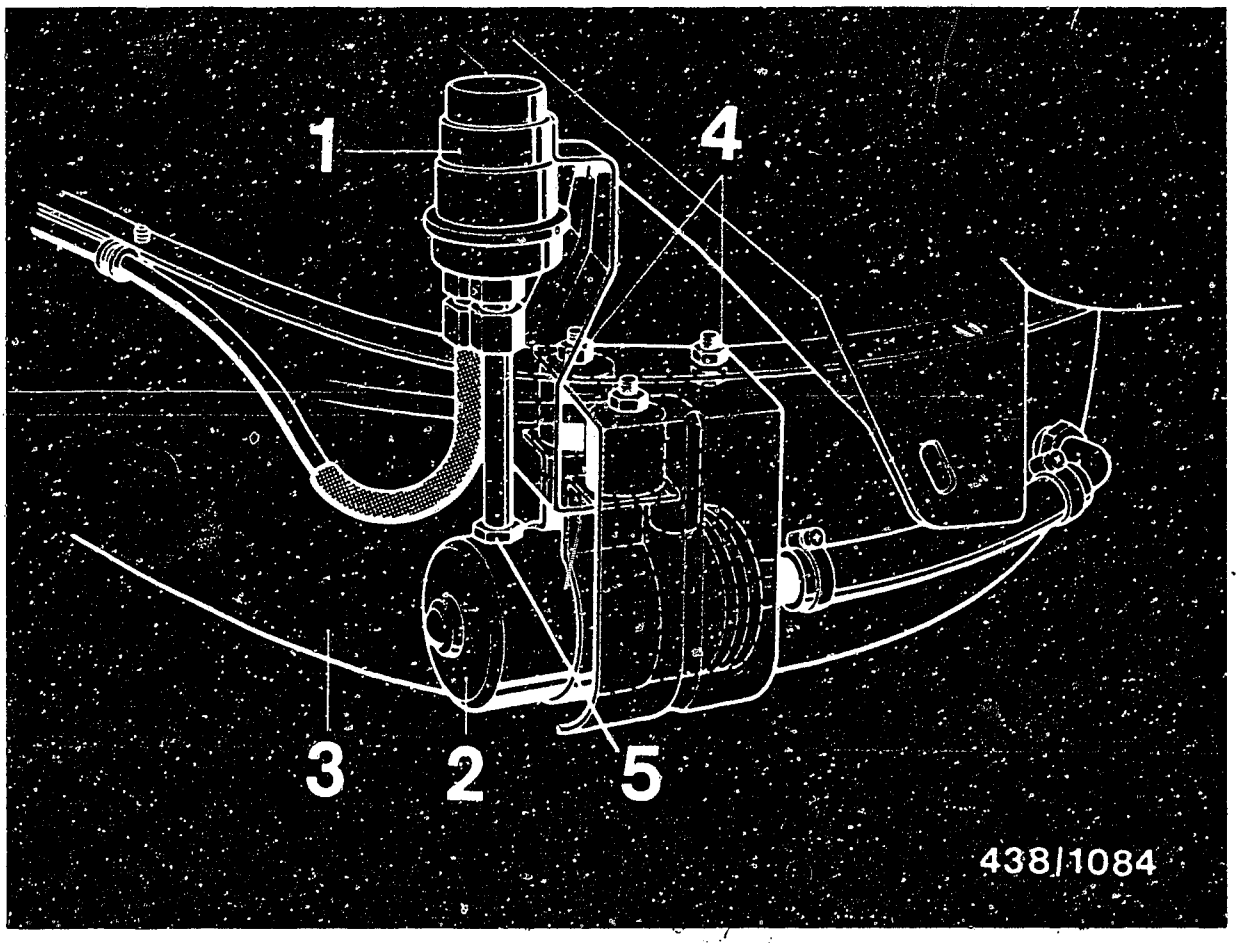
Fuel delivery

Delivered quantity: At least 750 cm^3 within 30 seconds.

12.5 Possible causes of insufficient fuel delivery

- Power supply to the electric fuel pump defective, voltage drop. Minimum voltage at terminal with pump operating = 11.5 V.
- Fuel filter very dirty.

If these points are O.K., the fault lies in the electric fuel pump itself.
Replace the electric fuel pump.



1 = Fuel accumulator
2 = Electric fuel pump
3 = Fuel tank
4 = Fastening nuts of bracket
5 = Delivery fitting with integrated non-return valve

12.6 Removing and installing the electric fuel pump:

Pinch off the intake hose before loosening (e.g. using hose clamper W 157 from Matra Co.) to prevent the escape of fuel.

Remove the complete bracket with electric fuel pump and fuel accumulator.

Unscrew delivery line from fuel accumulator and remove electric fuel pump from bracket.

Note: Replacing the electric fuel pump requires a new delivery line to the fuel accumulator. This requires a new 45 mm long piece of polyamide line, 8 mm inside diameter, for pressures of at least 25 bar.

Using a soldering iron, cut open the old line in the region of the delivery fitting (non-return valve) and of the screw nipple and remove.

Caution: Never use an open flame for heating the line. Danger of fire!
Cutting open the line with a knife is likewise not advisable because the tooth section of the fittings will be damaged.

Insert the new hose line into the assembly tool KDEP 1039 so that it projects by the amount of the length of the nipple. Clamp the assembly tool in a vice and knock the screw nipple cold into the line using a clean plastic mallet.

Clamp the other end of the delivery line in the same manner in the assembly tool and press cold onto the delivery fitting of the electric fuel pump.
Hold the electric fuel pump when doing this - do not clamp in a vice.

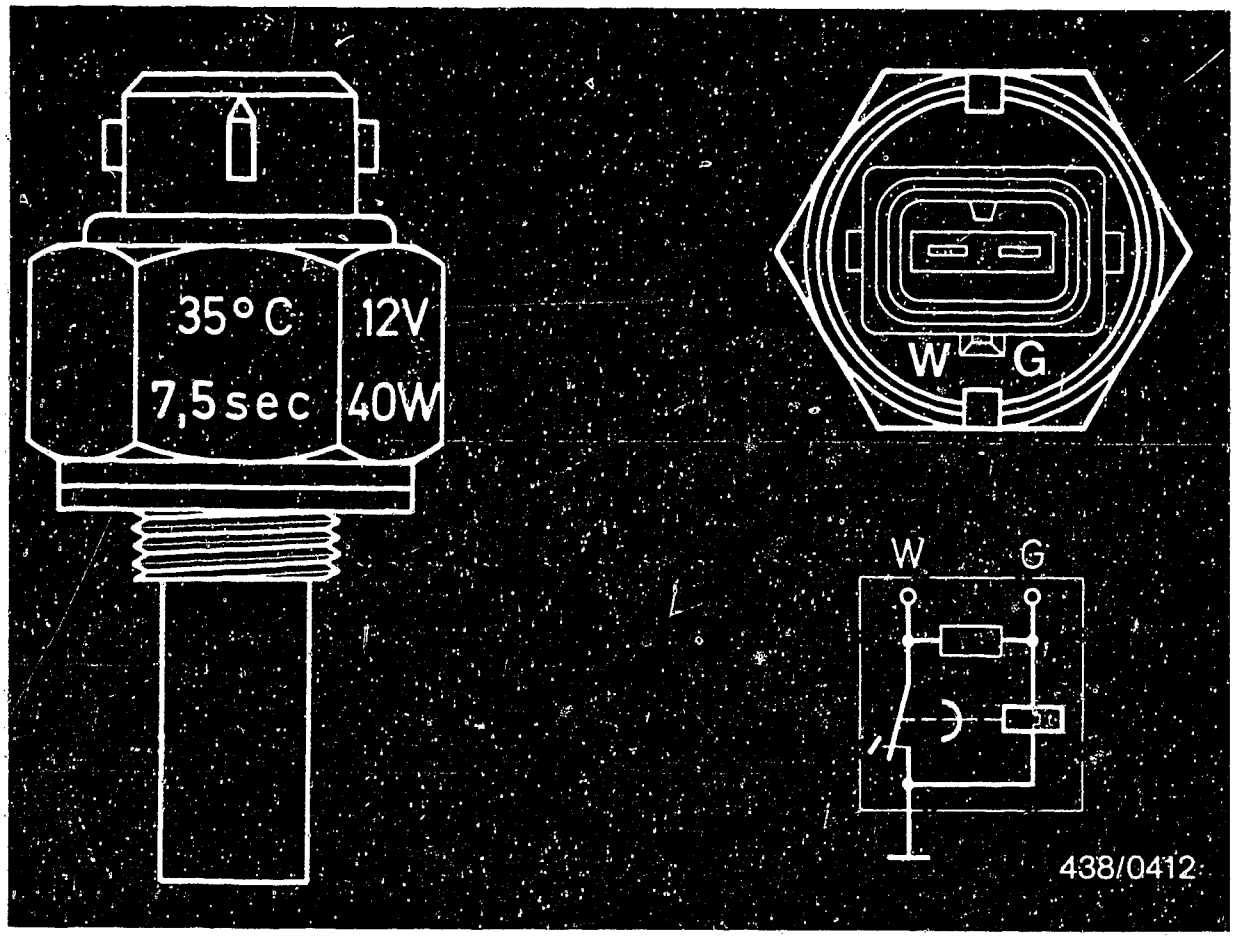
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which will lead subsequently to leaking.

Re-install the electric fuel pump. Remove the hose clamper from the intake hose and finally check all connections for leaks with the electric fuel pump operating.

13. Testing the cold-start system (thermo-time switch/ start valve)

13.1 Thermo-time switch:

Remove the thermo-time switch for testing.
It is in the engine block, under the intake port of cylinder 4.



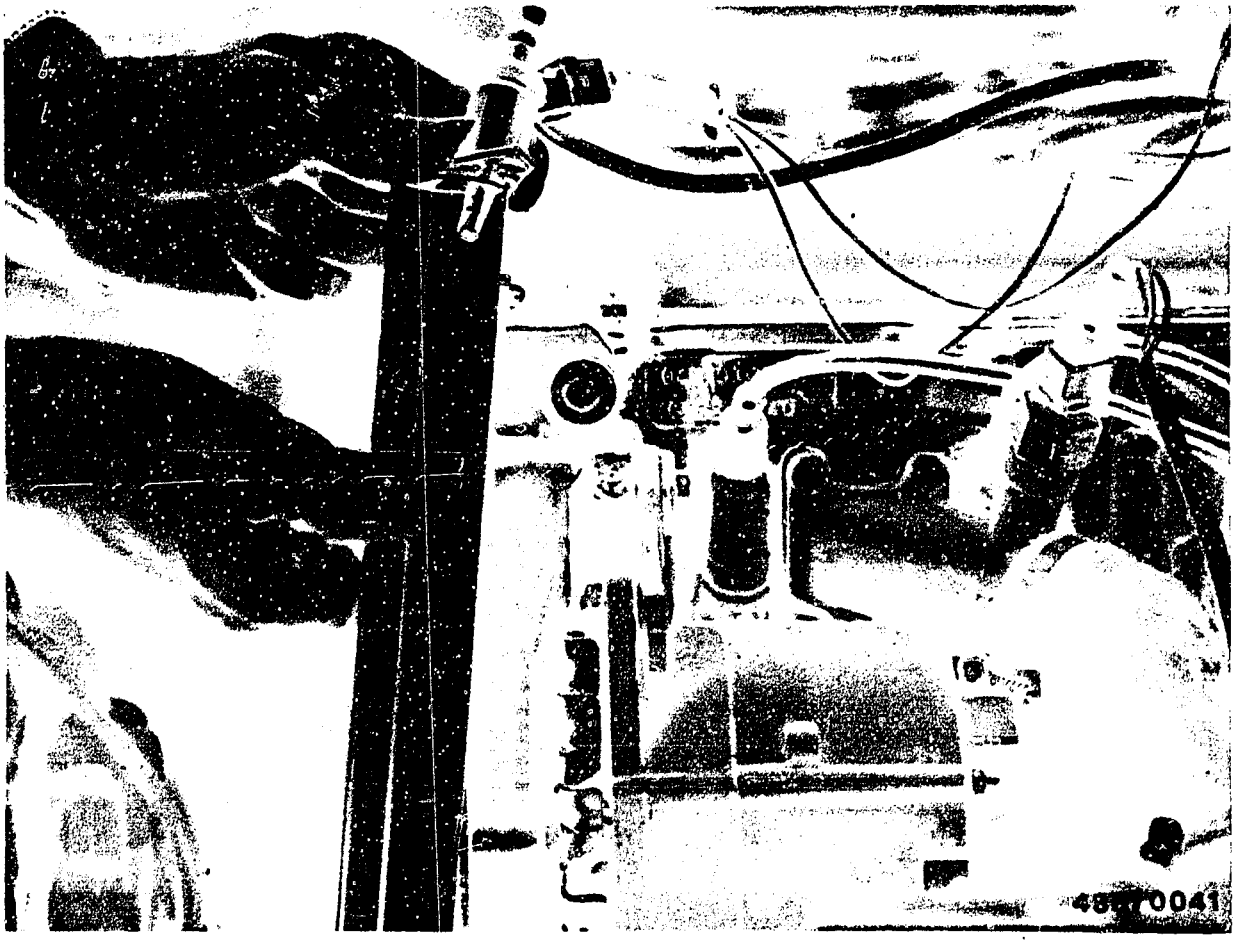
The thermo-time switch used in the Volvo (not a Bosch product) has a switching temperature of 35°C and a switching time at -20°C of 7.5 seconds. Both values are marked on the hexagonal section of the thermo-time switch.

The removed thermo-time switch is tested using an ohmmeter in accordance with the values given below.

The temperatures for the thermo-time switch can easily be obtained with water. Cooling takes place in a freezer chest.

Resistance measurement (Ω) between

At a temperature below °C	above °C	Term. "G" and "ground" (housing)	Term "W" and "ground" (housing)	Term "G" and term. "W"
+30		25...40 Ω	0 Ω	25 ... 40Ω
	+40	50...80 Ω	100...160 Ω	50 ... 80Ω



13.2 Start valve:

Remove the start valve. Hose line remains connected. Pull off the plug and connect the start valve directly to ground and to terminal 15 (e.g. at the ignition coil) using connecting cable KDJE 7450/70.

Important note:
During this test, do not let the connecting cable touch B +. Danger of fire due to sparking!
Hold the start valve in a suitable container (e.g. the graduate).

Switch on the electric fuel pump by bridging the safety circuit.
Switch on the ignition (max. 30 seconds). The start valve must now open and spray fuel.

Switch off the ignition, remove the electric connecting cable and dry the nozzle of the start valve.
The safety circuit remains bridged so that the primary pressure is applied to the start valve.
No droplets of fuel must drip from the nozzle of the start valve during the next minute. Even if shaken and knocked, the start valve must not leak.
Then switch the electric fuel pump off again.
Replace the start valve if it does not open or if it leaks.

If a leaky start valve or a defective thermo-time switch has been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.
Idle-speed adjustment is described on Coordinates F 6.

14. Checking the control pressures

14.1 Preliminary remarks:

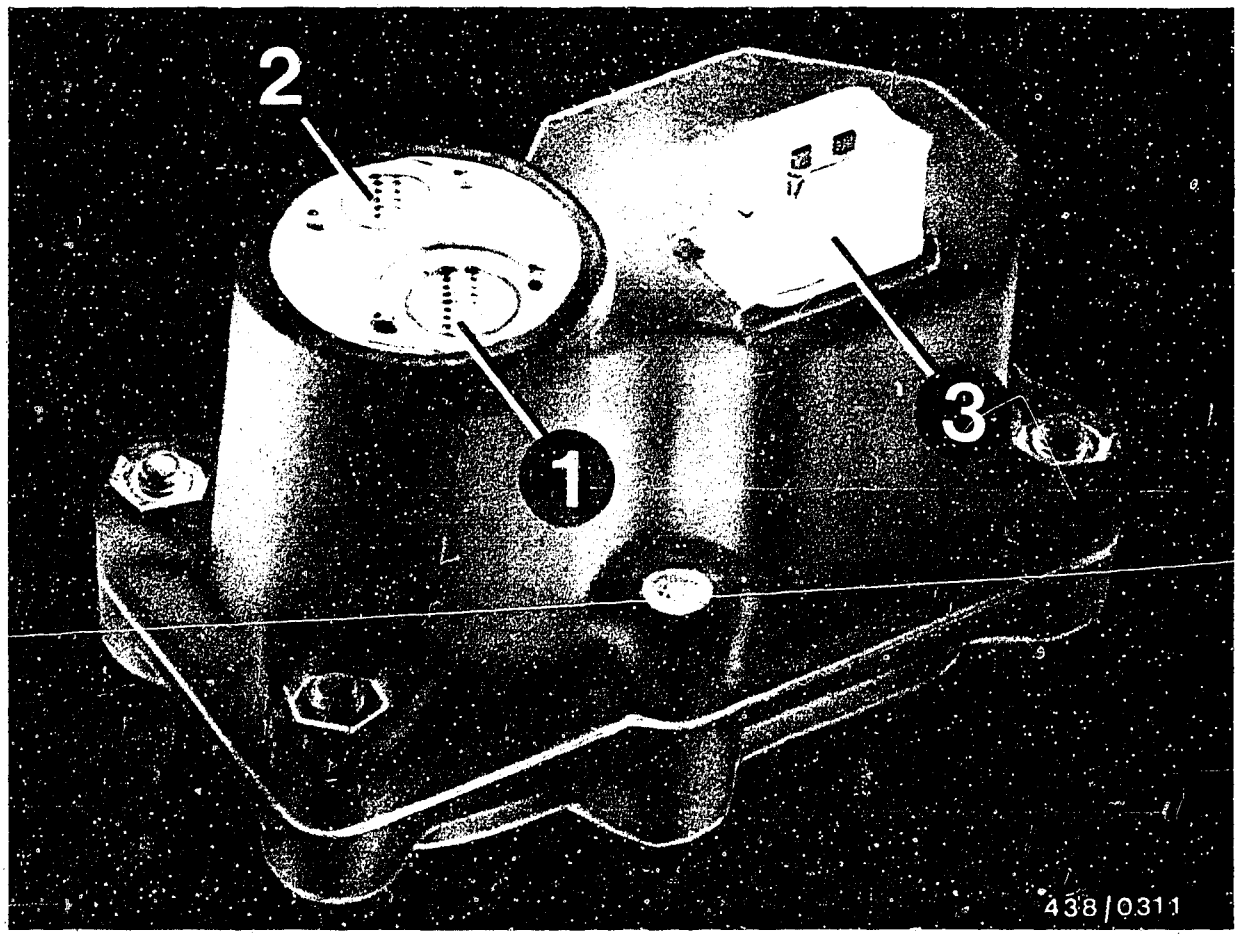
The control pressures tested in the following are in each case governed by the warm-up regulator.
If the test results are incorrect, however, this may also be due to faults which have nothing to do with the warm-up regulator.

These possible faults are:

- No or too low a voltage at the electric connector.
- Fuel return from the warm-up regulator blocked or constricted.
- Too high a fuel delivery for the control-pressure circuit.

The testing of this control-pressure delivery is described as an additional test step at the beginning of the control pressure tests.
Test specification: 160...240 cm^3/min.

Reference is made to the other possible causes of trouble in the respective test step.



1 = Intake port (M 10 x 1)
2 = Return port (M 8 x 1)
3 = Electrical connection

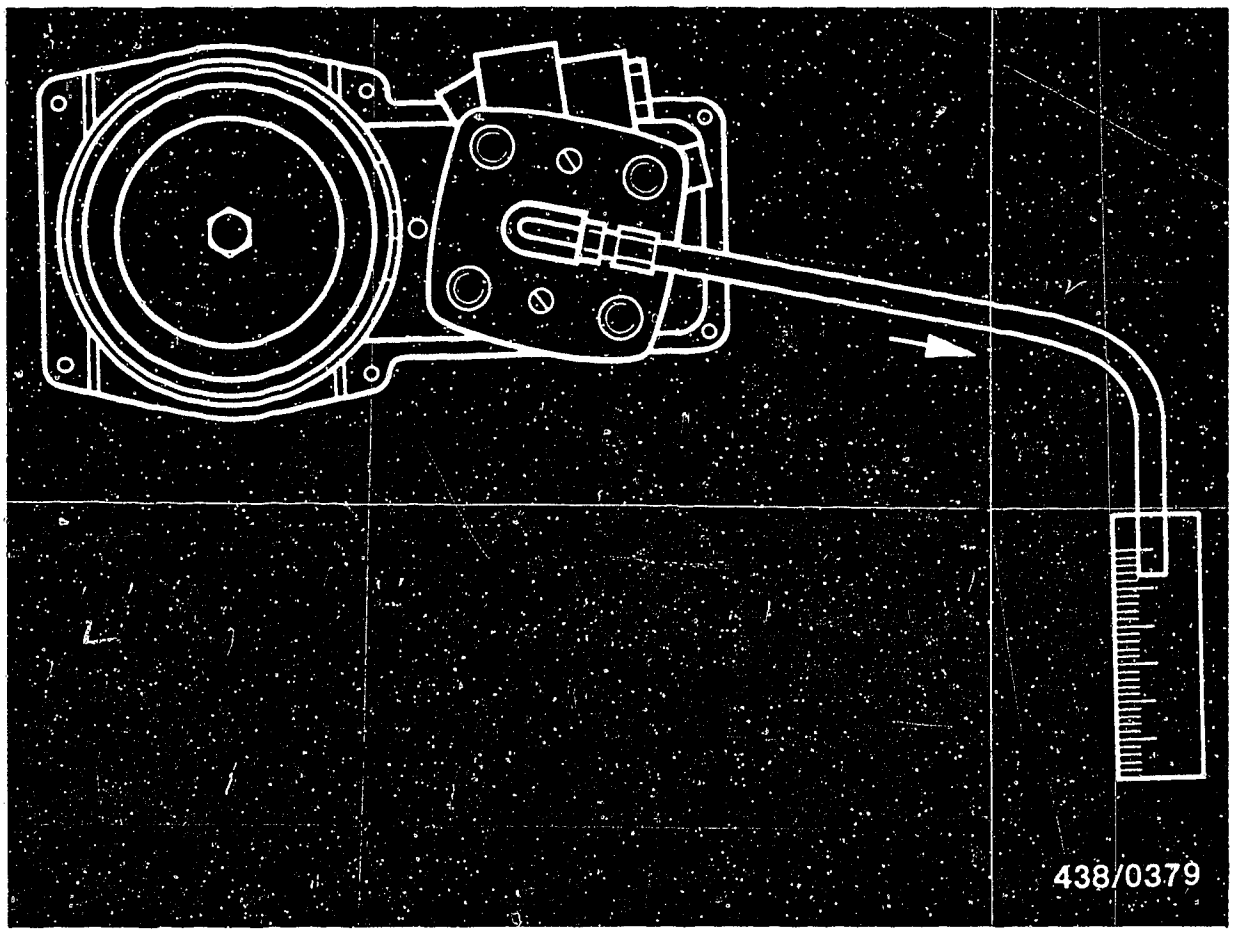
14.2 Design of warm-up regulator (1975 model)

The warm-up regulator corresponds to the standard design, i.e. apart from control pressure "cold" and "warm" no other functions (such as full-load and altitude compensation) are performed.

Version of warm-up regulator on 1974 model (Type 140)

This model is equipped with the warm-up regulator of the old type 0 438 140 002. Externally it differs clearly from the now customary type and is equipped with rigid tailpieces. However, its operation is exactly the same. In case of replacement, only the version 0 438 140 004 of the 1975 model is available.

So that the original hose line for fuel inlet can remain in the vehicle, a fitting 1 437 000 000 is required for conversion.



14.3 Checking the fuel delivery for the control-pressure circuit:

Before testing, make sure that the electric fuel pump is operating properly.
Test specification: 750 cm³/30 s

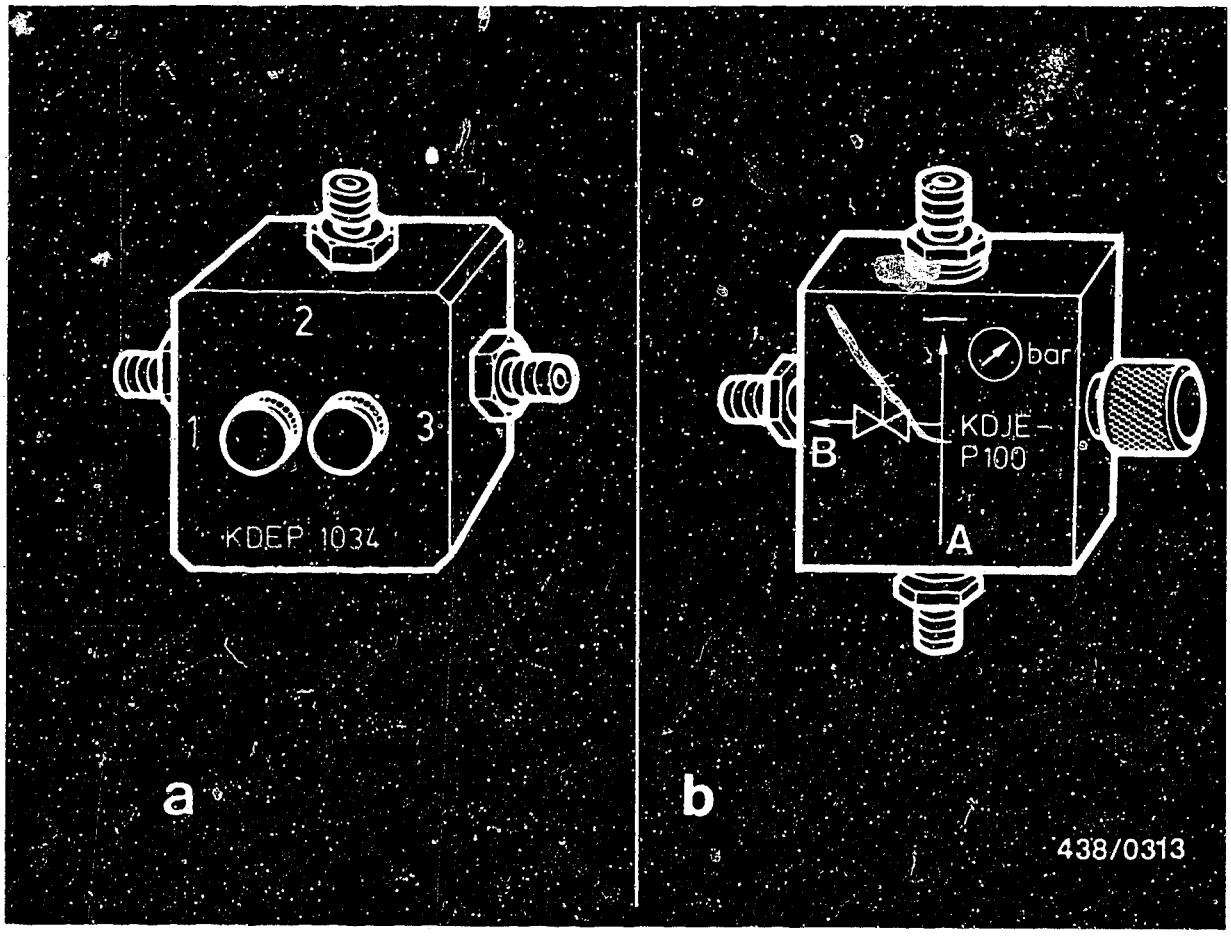
Unscrew the control-pressure line (to the warm-up regulator) from the fuel distributor.

Connect one of the two connecting hoses of the pressure tester KDJE-P 100 (previously KDEP 1034) to the control-pressure port of the fuel distributor (thread M 12 x 1.5) and hold hose in graduate (approx. 0.5 litre capacity).

Switch on the electric fuel pump for 1 minute by bridging the safety circuit.
Measure delivery.

Test specification: 160...240 cm^3/min.

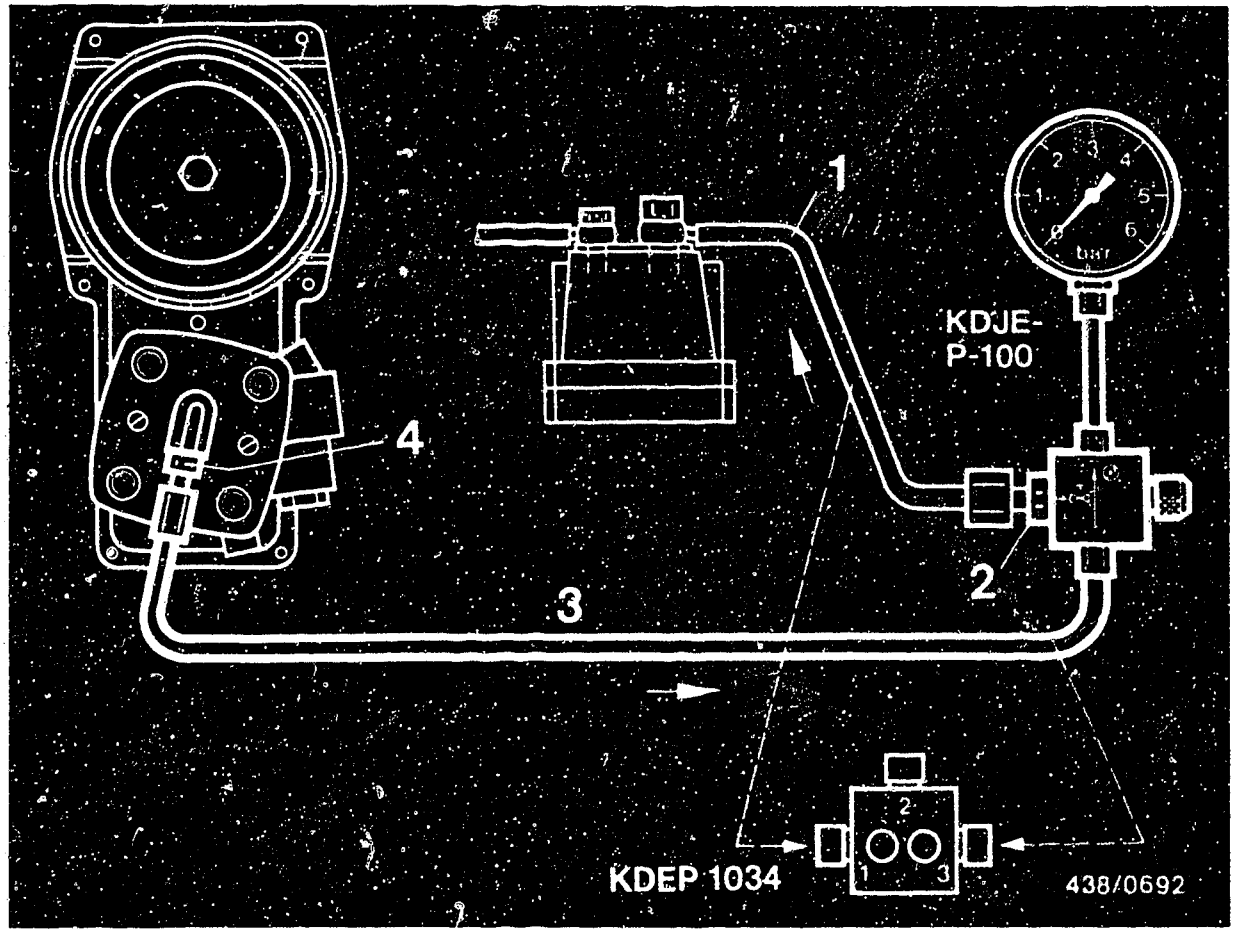
If the measured value is outside tolerance, the fault is in the fuel distributor.
Replace the fuel distributor.



14.4 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a). Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:
A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

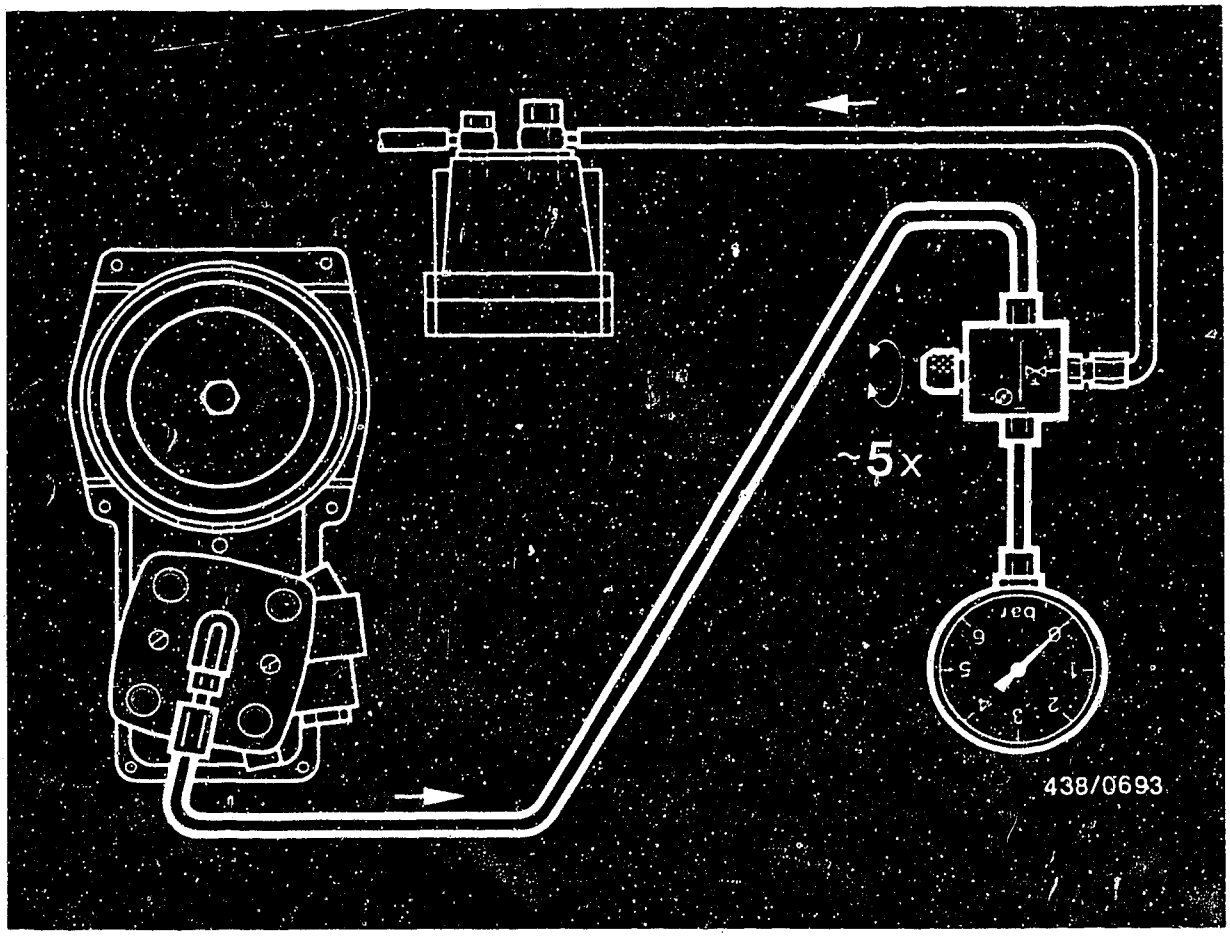
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor. Suspend the pressure gauge from the hood (possibly using a wire hook).



14.5 Bleeding the pressure tester

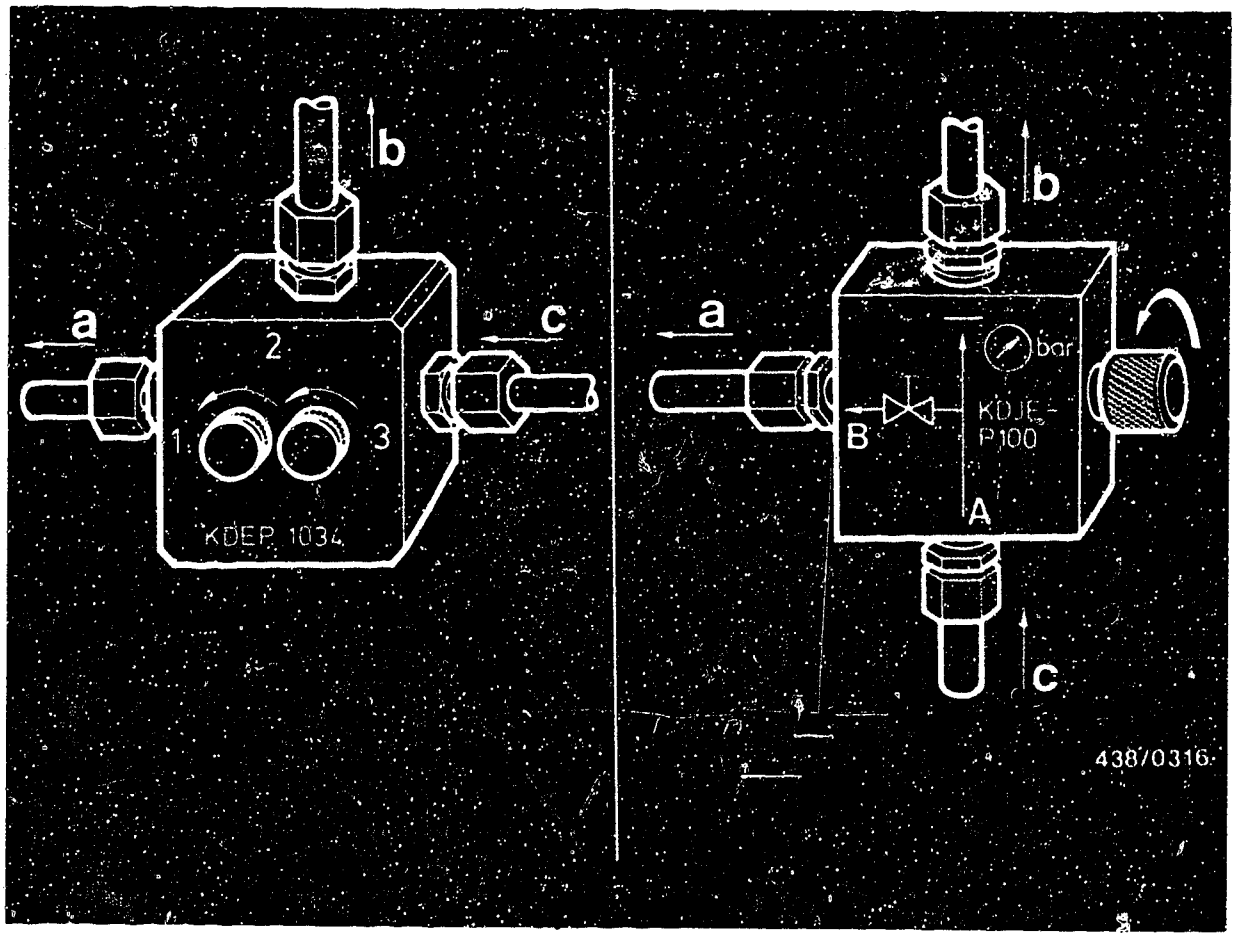
Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).

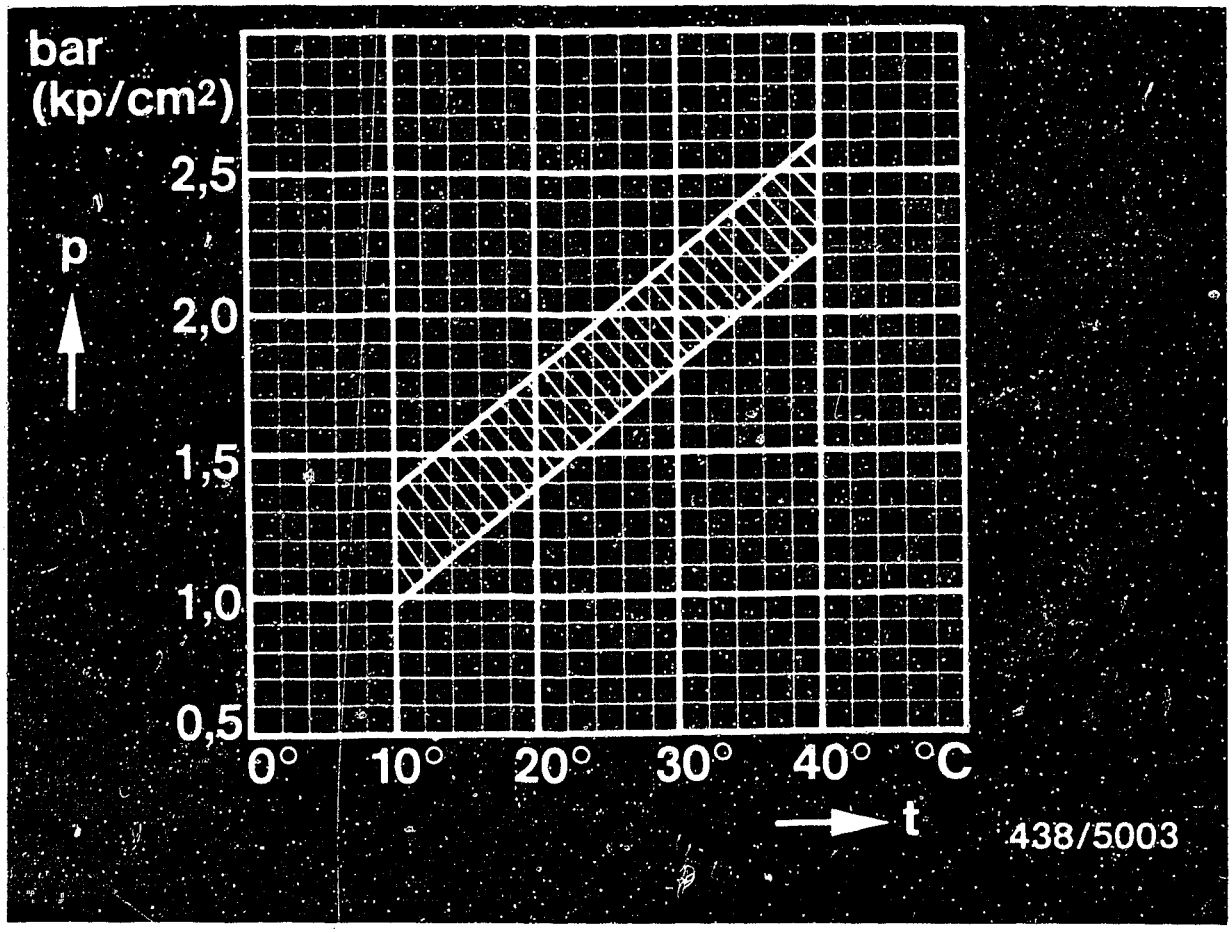


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.6 Testing the "cold" control pressure:

Warm-up regulator: 0 438 140 002
004

The test is performed with the engine switched off. The engine must be cold. For this purpose, the engine should have been switched off for several hours, preferably overnight.
Pull off the plug from the warm-up regulator.
Open the valve screw of the directional-control valve (both screws in the case of KDEP 1034).
Switch on the electric fuel pump by bridging the electrical safety circuit.



p = Control pressure (bar or kgf/cm^2 gauge pressure)
t = Ambient temperature (^{o}C)

Warm-up regulator Part No.: 0 438 140 002
004

Calculate the nominal control pressure in accordance with the ambient temperatures in the graph.

Example: Ambient temperature = 20^{o}C
Nominal control pressure = 1.4...1.8 bar gauge pressure

If the measured "cold" control pressure differs from the nominal value, this may be due to one of the following faults:

- Fuel delivery for the control-pressure circuit too low or too high.
  Test fuel delivery.
  Test value: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted (if control pressure too high).
  Eliminate constriction.

- Warm-up regulator defective. Replace warm-up regulator.

Note on replacing warm-up regulator 0 438 140 002 in the 1974 model (Type 140..):

In case of replacement, only warm-up regulator 0 438 140 004 of the 1975 model is available. So that the original hose line for fuel inlet can remain in the vehicle, a fitting 1 437 000 000 is required. This is screwed into the inlet connection of the warm-up regulator 0 438 140 004.

Notes on removing the polyamide line from the defective warm-up regulator:

Using a soldering iron, cut open the fuel line in the region of the fitting and pull off.

Caution: Never use an open flame for heating the line. Danger of fire!

Cutting open the line with a knife is likewise not advisable if only the line is to be replaced and the fitting is to be used again. The tooth section of the fitting would be damaged, which may lead subsequently to leaks.

Mounting the line:

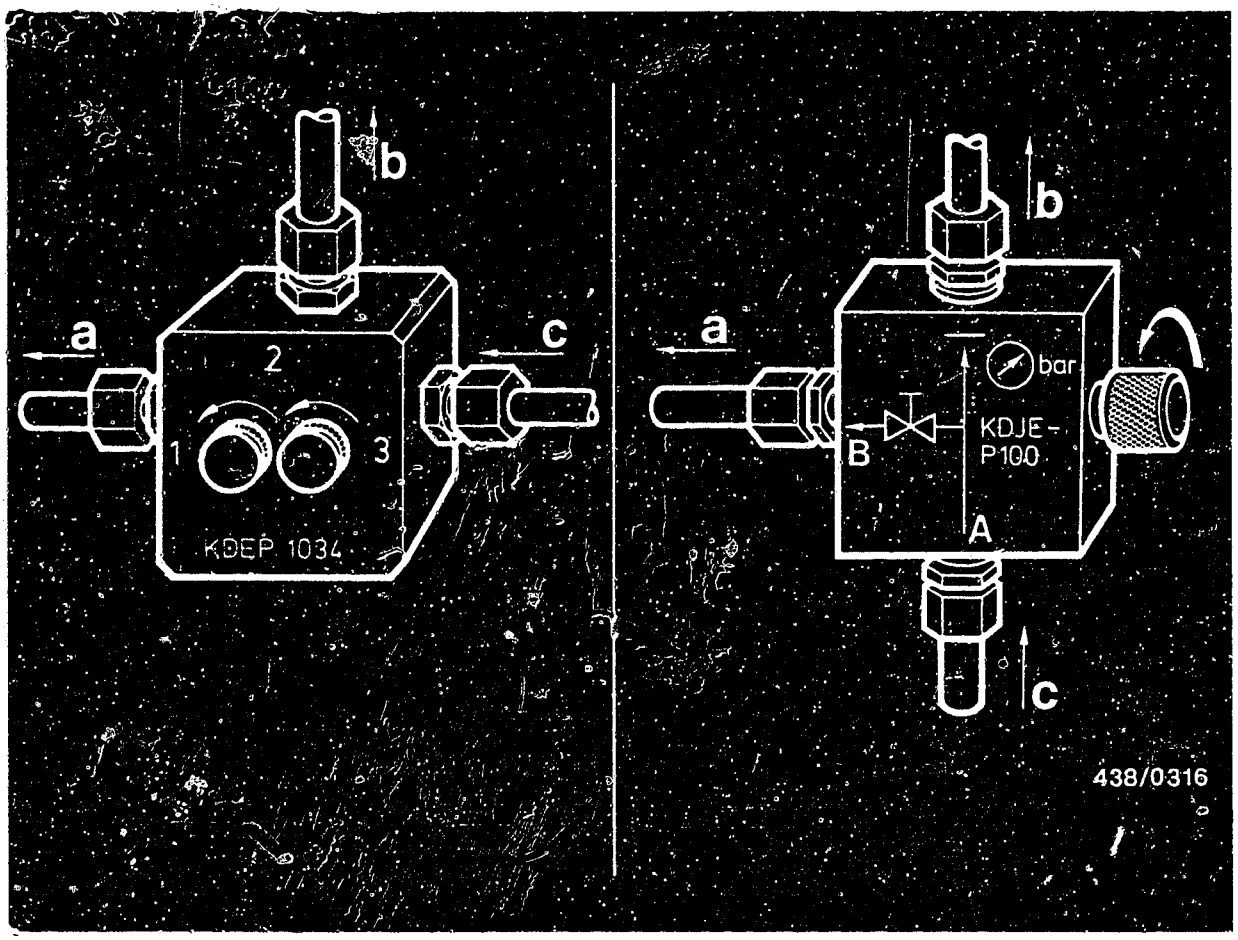
Cut off the section of the line which has been cut open.

Insert the line into assembly tool KDEP 1039 so that it projects by the amount of the length of the fitting.

Press the line cold onto the fitting.
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which may lead subsequently to leaking.

When the warm-up regulator has been replaced or a fault remedied, it is necessary to carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinates F6.



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

14.7 Testing the "cold" control pressure:

Fuel distributor Part No.: 0 438 140 002
0 438 140 004

Testing is performed with the engine stopped.
Open hollow screw of directional-control valve (both on KDEP 1034).

Switch on the electric fuel pump by bridging the electrical safety circuit.

Attach the plug to the warm-up regulator.

Control pressure now rises (the warm-up regulator in the process of shutting off) until the "warm" control pressure is reached.

Test specifications for "warm" control pressure:	3.4...3.8 bar gauge pressure (3.5...3.9 kgf/cm³ gauge pressure)

If the measured "warm" control pressure differs from the test specification, this may be due to one of the following faults:

If control pressure too high:

- Fuel delivery for the control-pressure circuit too high.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Fuel return from the warm-up regulator blocked or constricted. Eliminate constriction.

- Warm-up regulator has hydraulic defect.
  Replace warm-up regulator.

If control pressure too low:

- Power supply open-circuit.
  Eliminate open circuit. Ensure that the plug is contacting properly.

- Battery voltage too low, voltage drop.
  Eliminate voltage drop. Minimum voltage at connector: 11.5 V.
  If necessary, repeat test with engine running in order to obtain the normal generator voltage of approx. 14 V when the vehicle is in operation.

- Fuel delivery for the control-pressure circuit too low.
  Test fuel delivery.
  Test specification: 160...240 cm^3/min.

- Warm-up regulator defective. Heating coil open-circuit. Hydraulic defect. Replace warm-up regulator.

Notes on replacing warm-up regulator 0 438 140 002 in 1974 model (type 140..):

Should a replacement be required, only warm-up regulator 0 438 140 004 of 1975 model is available. A fitting 1 437 000 000 is required so that the original hose line for fuel inlet can remain in the vehicle. This is screwed into the inlet connection of warm-up regulator 0 438 140 004.

Notes on removing the polyamide line from the defective warm-up regulator:

Using a soldering iron, cut open the fuel line in the region of the fitting and pull off.

Caution: Never use an open flame for heating the line. Danger of fire!

Cutting open the line with a knife is likewise not advisable if only the line is to be replaced and the fitting is to be used again. The tooth section of the fitting would be damaged, which may lead subsequently to leaks.

Mounting the line:

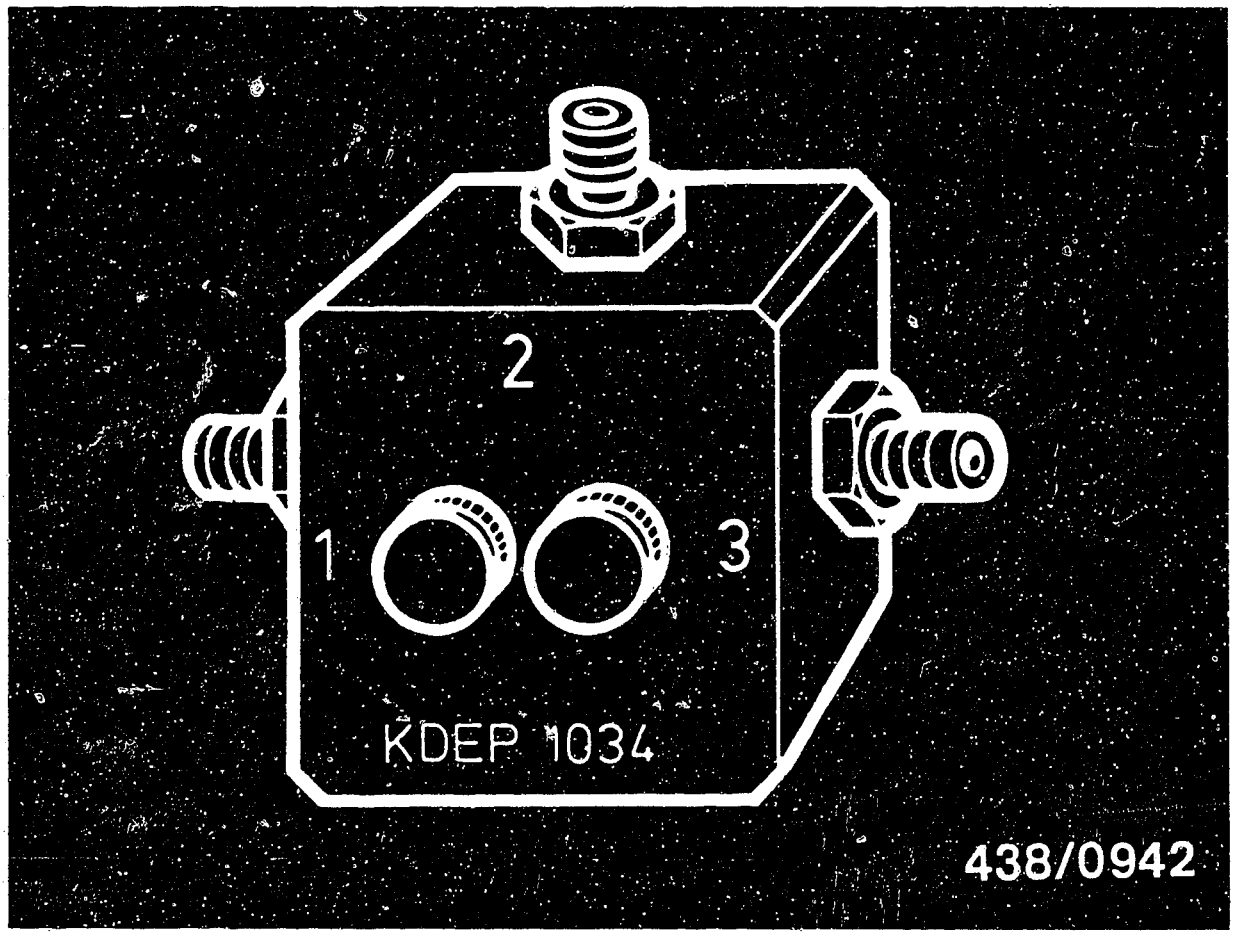
Cut off the section of the line which has been cut open.

Insert the line into assembly tool KDEP 1039 so that it projects by the amount of the length of the fitting.

Press the line cold onto the fitting.
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which may lead subsequently to leaking.

When the warm-up regulator has been replaced or a fault remedied, it is necessary to carry out the idle adjustment with the engine at normal operating temperature.

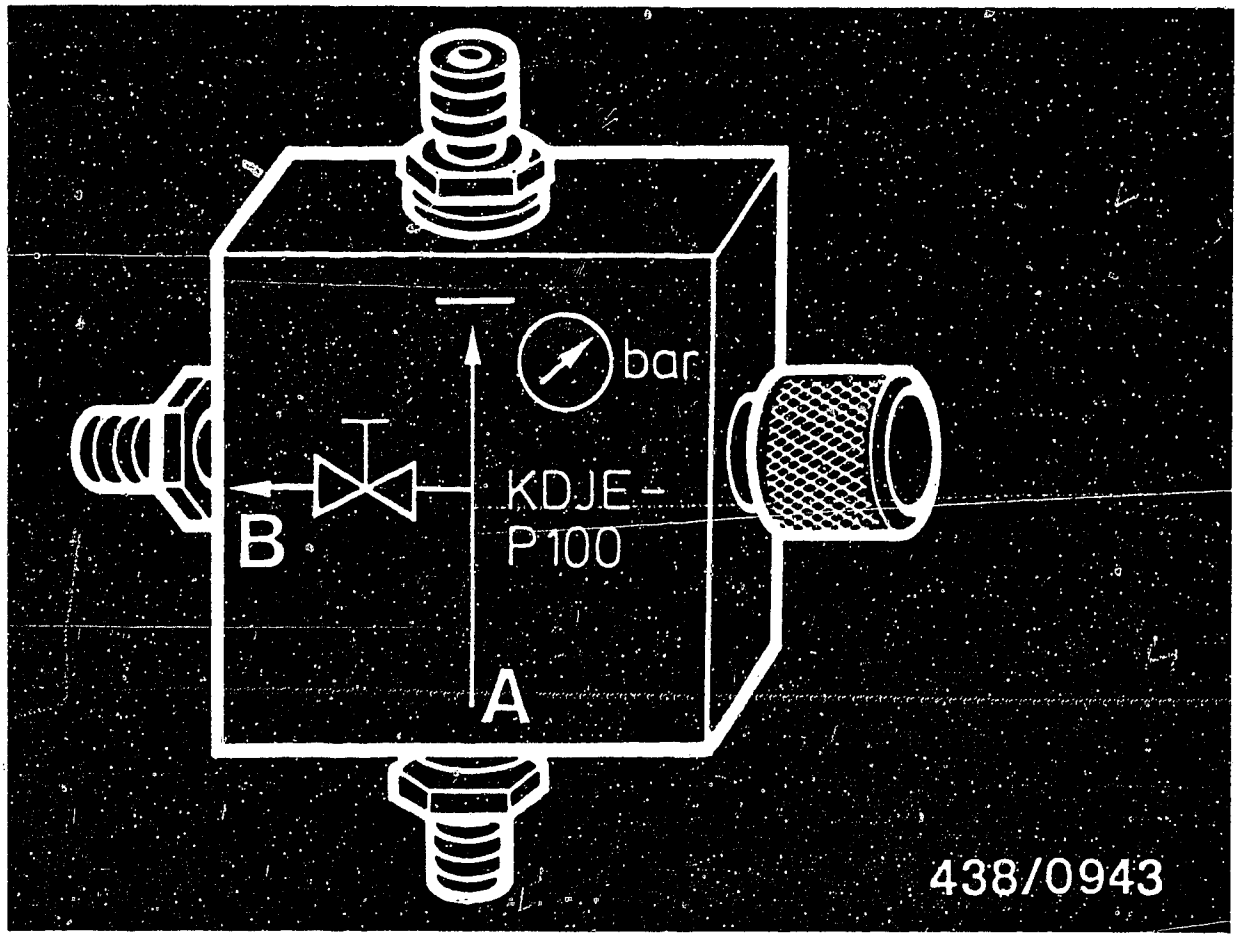
Idle adjustment is described on Coordinates F6.



15. Testing and adjusting the primary pressure

15.1 Mounting pressure tester KDJE-P 100 (previously KDEP 1034):

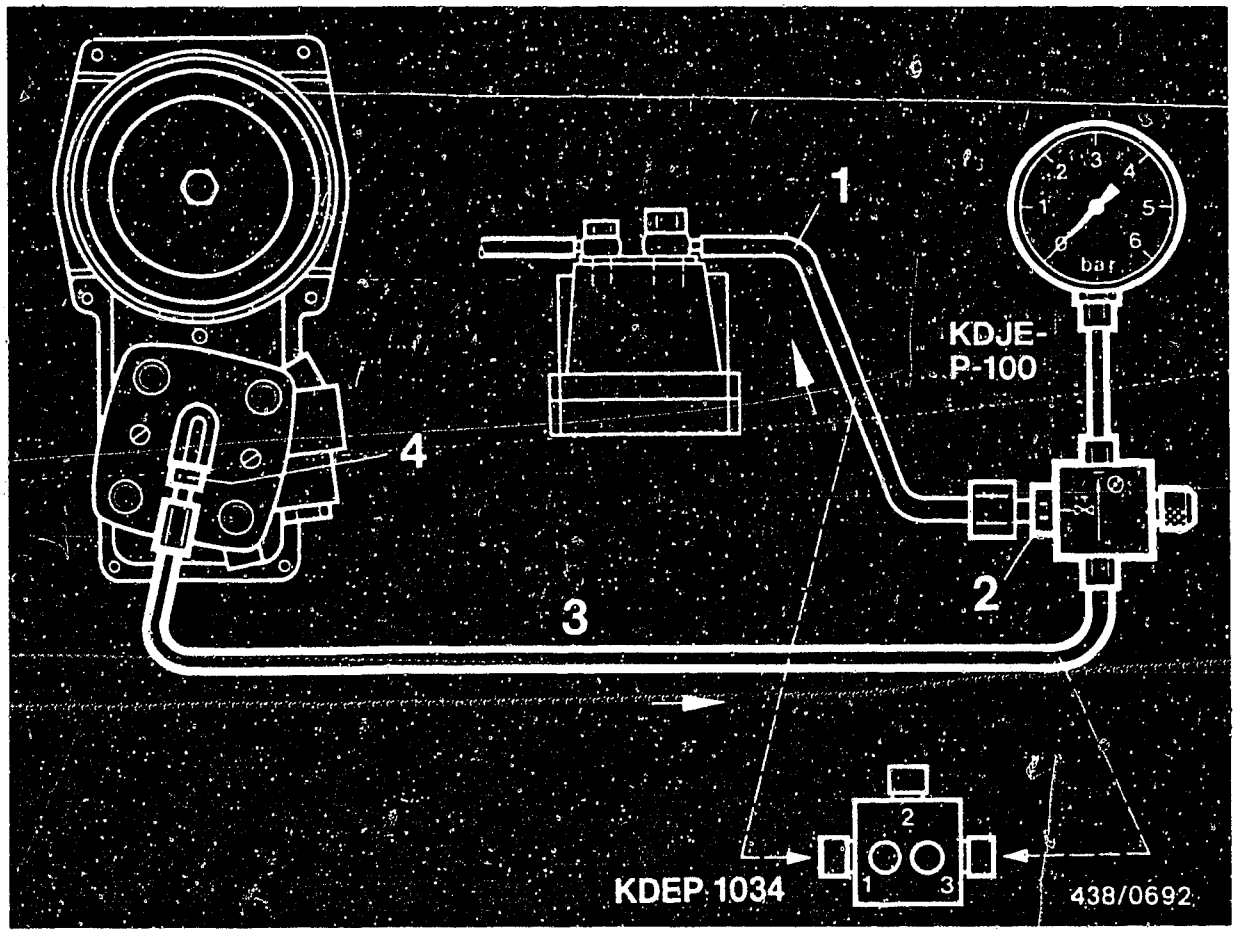
The pressure tester KDEP 1034 is equipped with a 3-way valve with 2 separate hollow screws. The connections of the directional-control valve are numbered.



Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

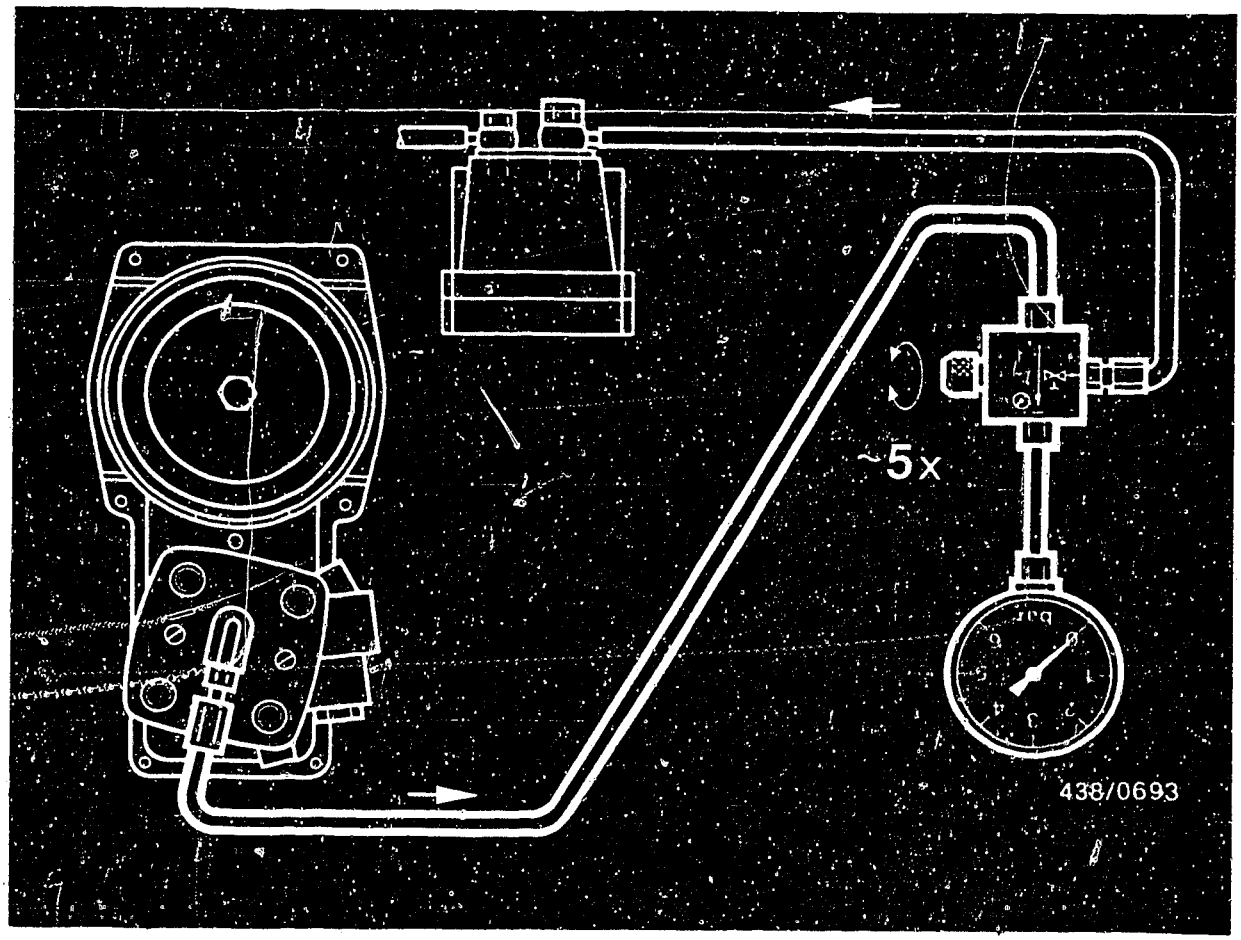
Caution:
When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.



The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor.
Suspend the pressure gauge from the hood (possibly using a wire hook).



15.2 Bleeding the pressure tester

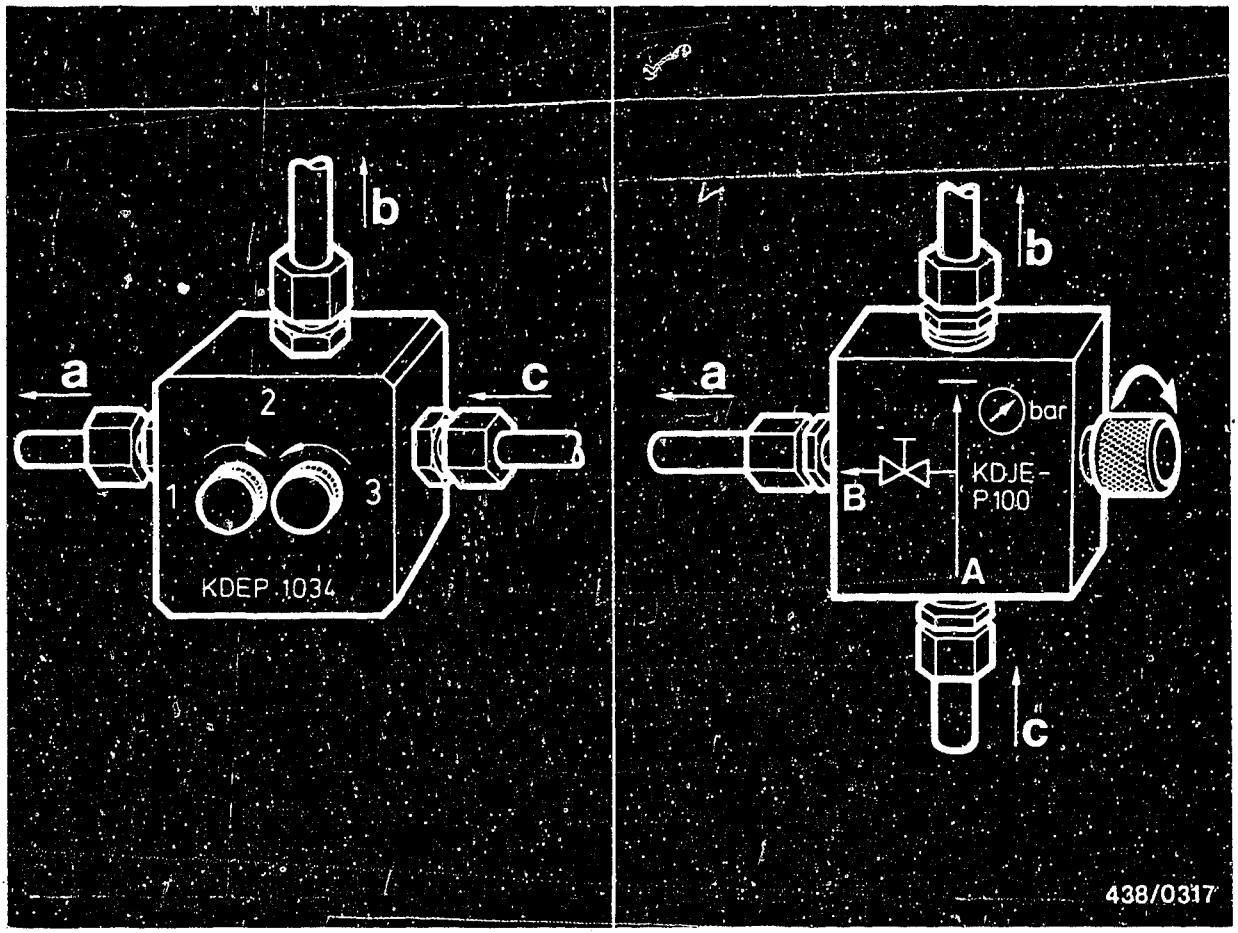
Disconnect the electric plug from the warm-up regulator and the auxiliary-air device.
Let the pressure gauge hang down (hose fully extended).

Switch on the electrical fuel pump by bridging the electrical safety circuit.

Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times.

Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).

Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

15.3 Testing the primary pressure:

The test is performed with the engine switched off. The temperature of the engine is not important.

Close the valve screw of directional-control valve KDJE-P 100. In the case of KDEP 1034, close valve screw 1, open valve screw 3.

Fuel distributor Part No.	Test specifications - primary pressure (gauge pressure)
0 438 100 003 0 438 100 005	4.5...5.2 bar (4.6...5.3 kgf/cm²)

Possible causes for too low a primary pressure:

- Fuel supply faulty
(Delivery of electric fuel pump too low).

- Primary pressure set incorrectly.

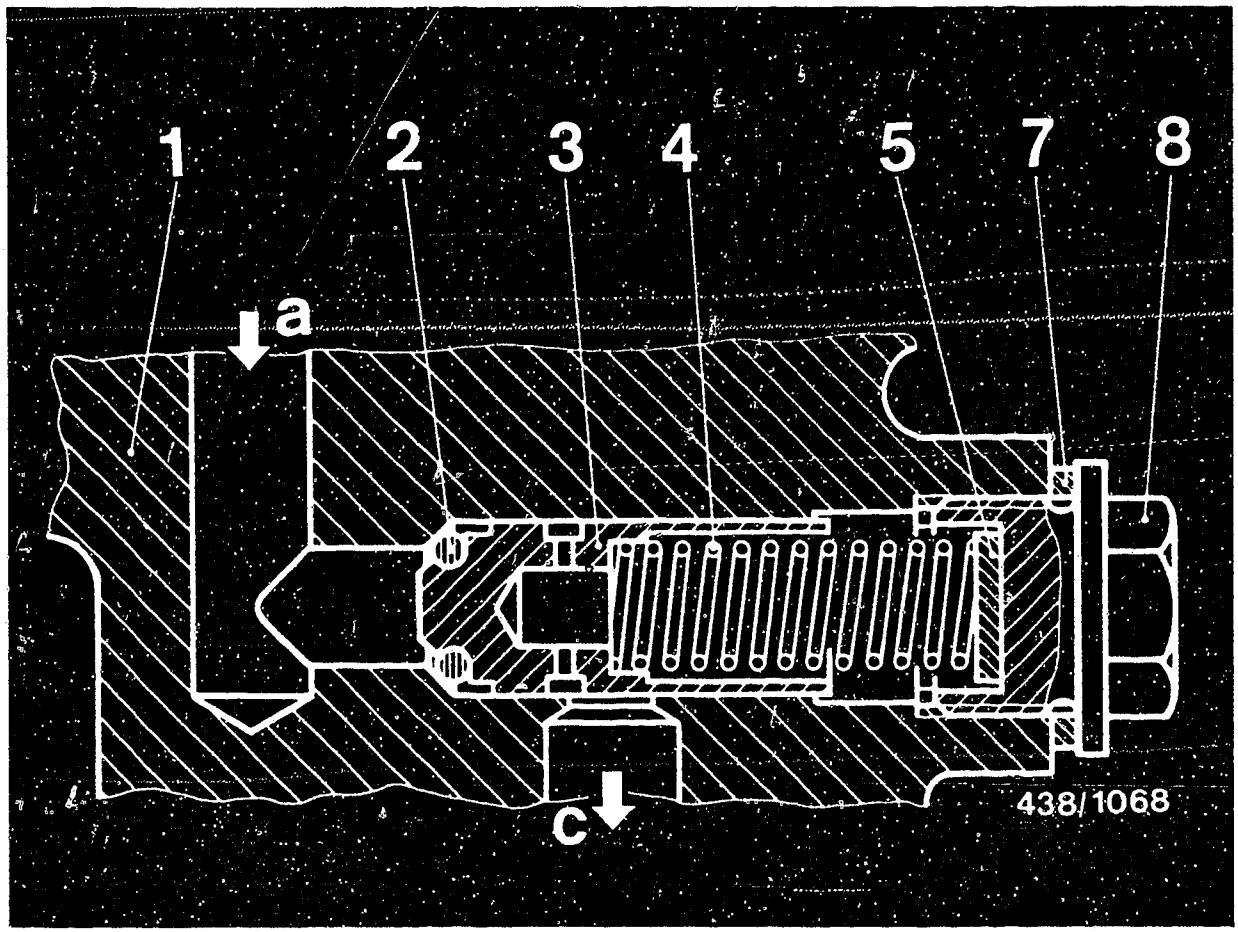
A precondition for readjustment of the primary pressure is always that the fuel supply is in order.
Measure the fuel delivery. (Test specification: 750 cm³/30 s.

Possible causes for too high a primary pressure:

- A restriction in the return line leading to the fuel tank.

- Primary-pressure regulator set incorrectly.

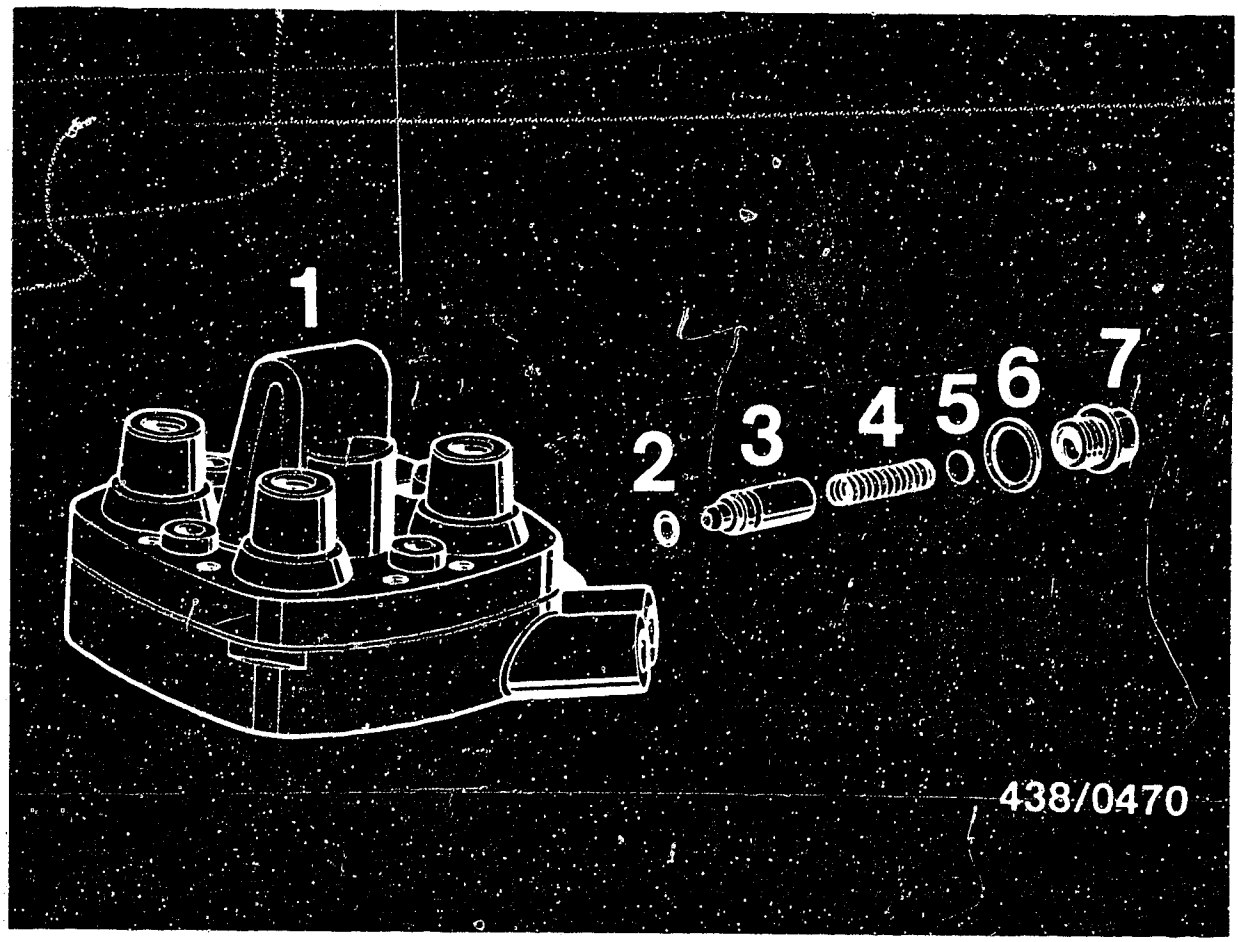
For this reason, before readjusting too high a primary pressure, always first check the condition of the return line leading to the fuel tank.



a = Primary pressure
c = Fuel return
1 = Fuel-distributor housing
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
7 = Flat seal ring
8 = Screw plug

15.4 Adjusting the primary pressure:

Fuel distributor	Primary-pressure adjusting valve (gauge pressure)
0 438 100 003 0 438 100 005	4.7...4.9 bar (4.8...5.0 kgf/cm²)



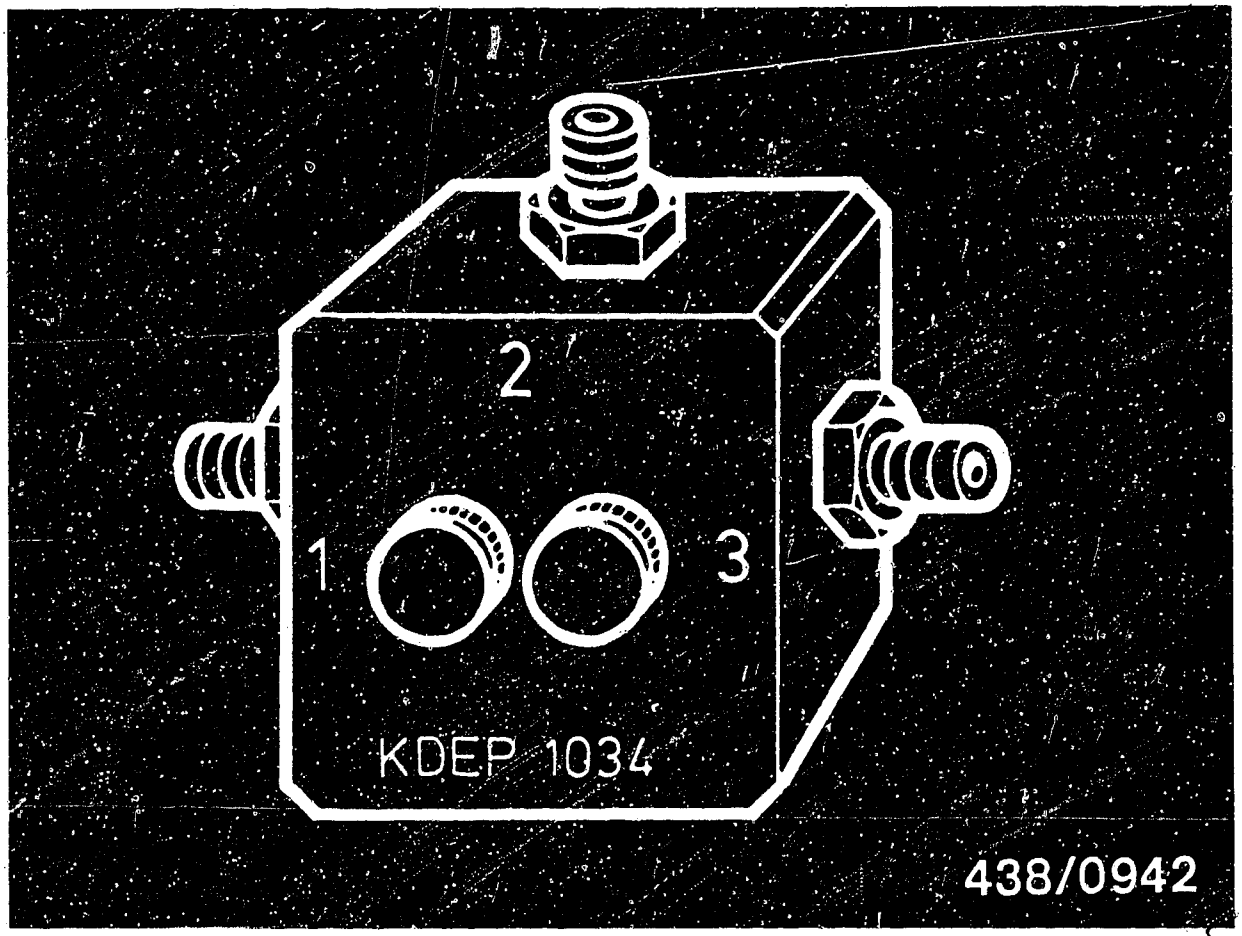
1 = Fuel distributor
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug

Readjust the primary pressure by changing shims Item 5.

Note: 0.1 mm more shim thickness means approx. 0.15 bar pressure increase and vice versa.

When mounting the screw plug, always use a new seal ring - Item 6.

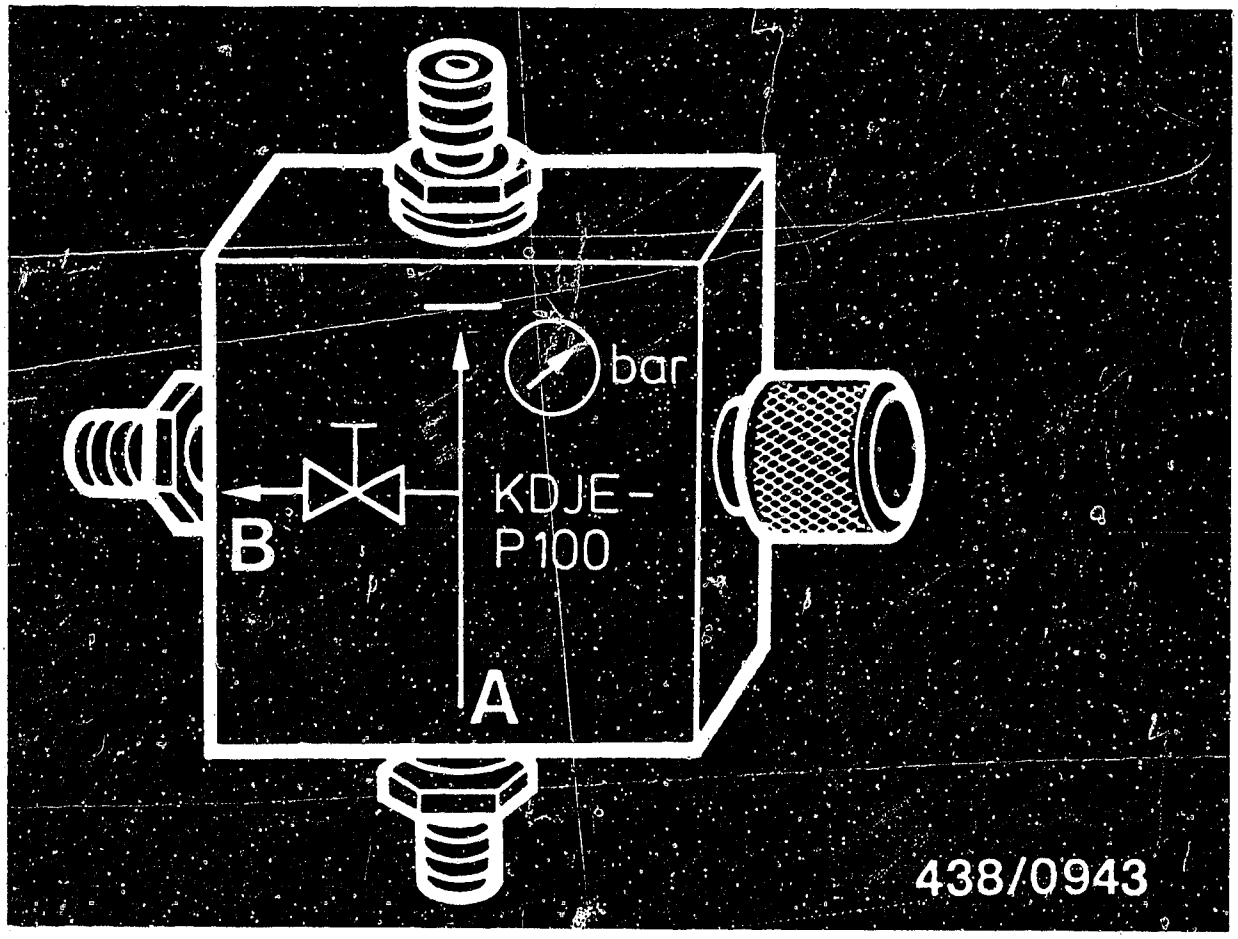
The control piston of the primary-pressure regulator must not be lost. It was matched at the factory to the fuel-distributor housing and is, therefore, the only part of the primary-pressure regulator which must not be replaced.



16. Testing the entire fuel system for leaks.

16.1 Mounting the pressure tester KDJE-P 100 (formerly KDEP 1034):

The pressure tester KDEP 1034 is equipped with a three-way valve with 2 separate valve screws. The connections of the directional-control valve are numbered (Fig. a).

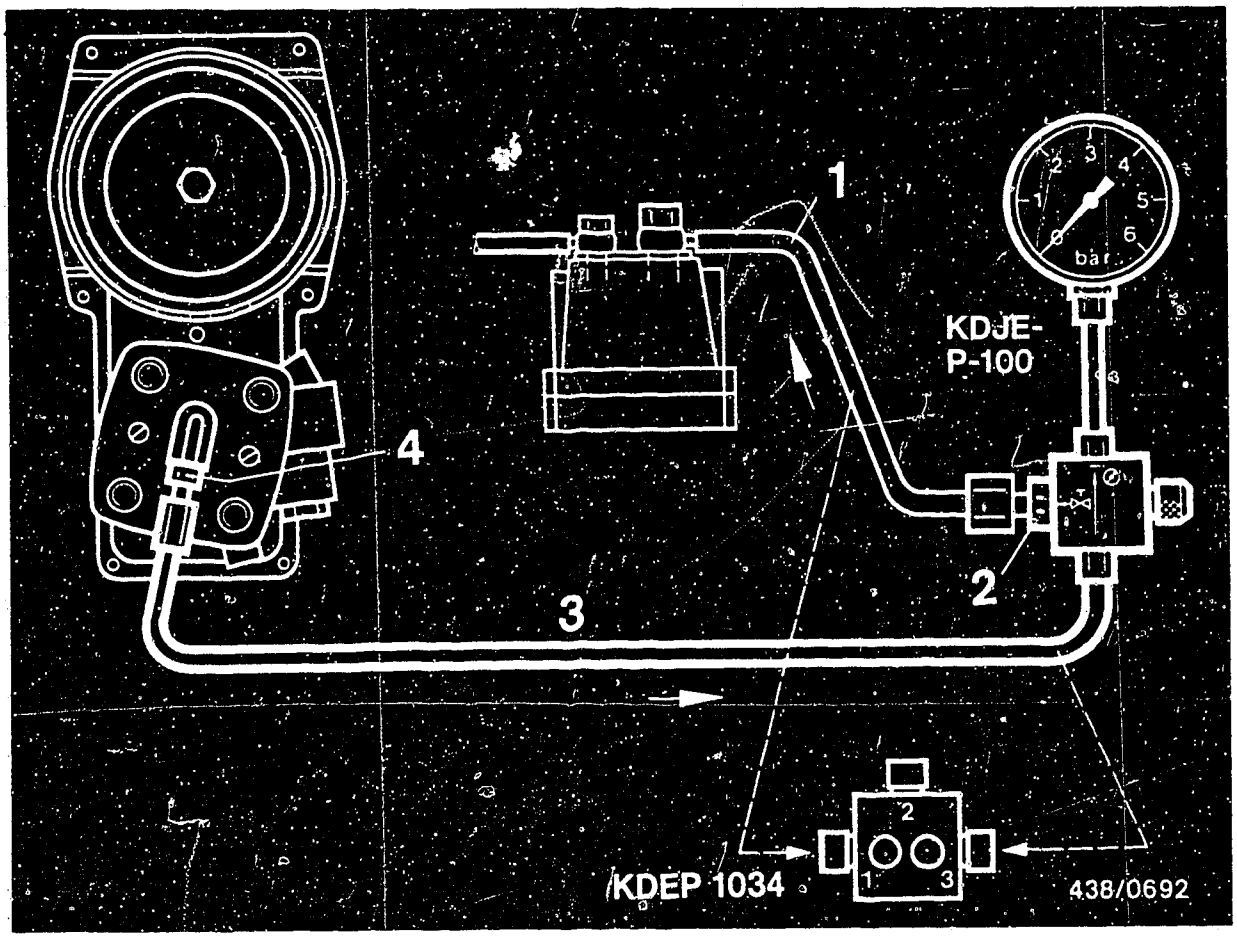


Since the end of 1979 the pressure tester KDJE-P 100 has been supplied. Its directional-control valve has only one valve screw (Fig. b). The connections of this directional-control valve are identified by symbols:

A = Inlet (from the fuel distributor)
B = Outlet (to the warm-up regulator)

Caution:

When the directional-control valve is not in use, always keep the valve screw(s) open in order to relieve the pressure on the seal rings.

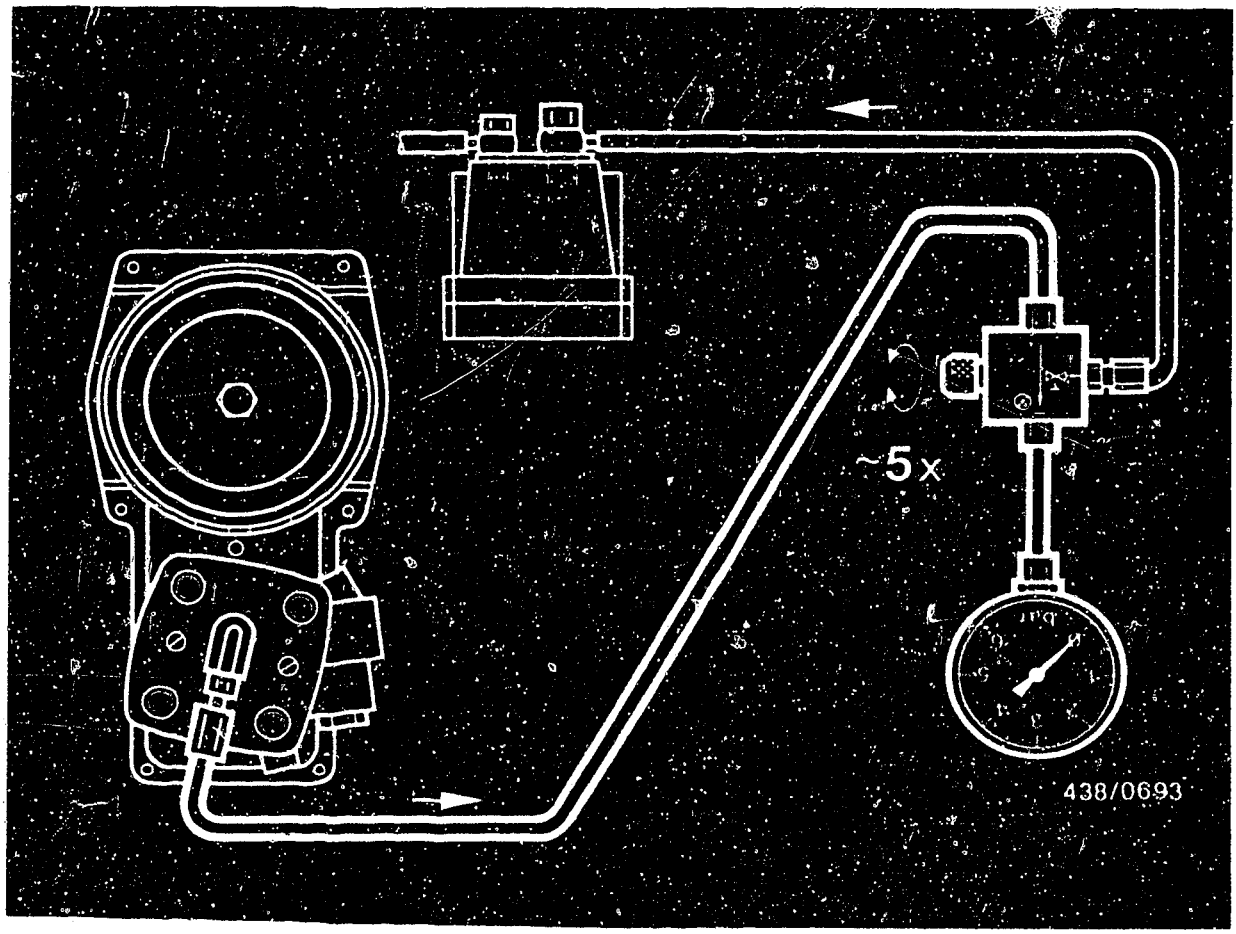


The directional-control valve of the pressure tester is connected into the control-pressure line from the fuel distributor to the warm-up regulator.

Unscrew the control-pressure line (1) from the fuel distributor and connect to outlet fitting B or 1 (2) of the directional-control valve.

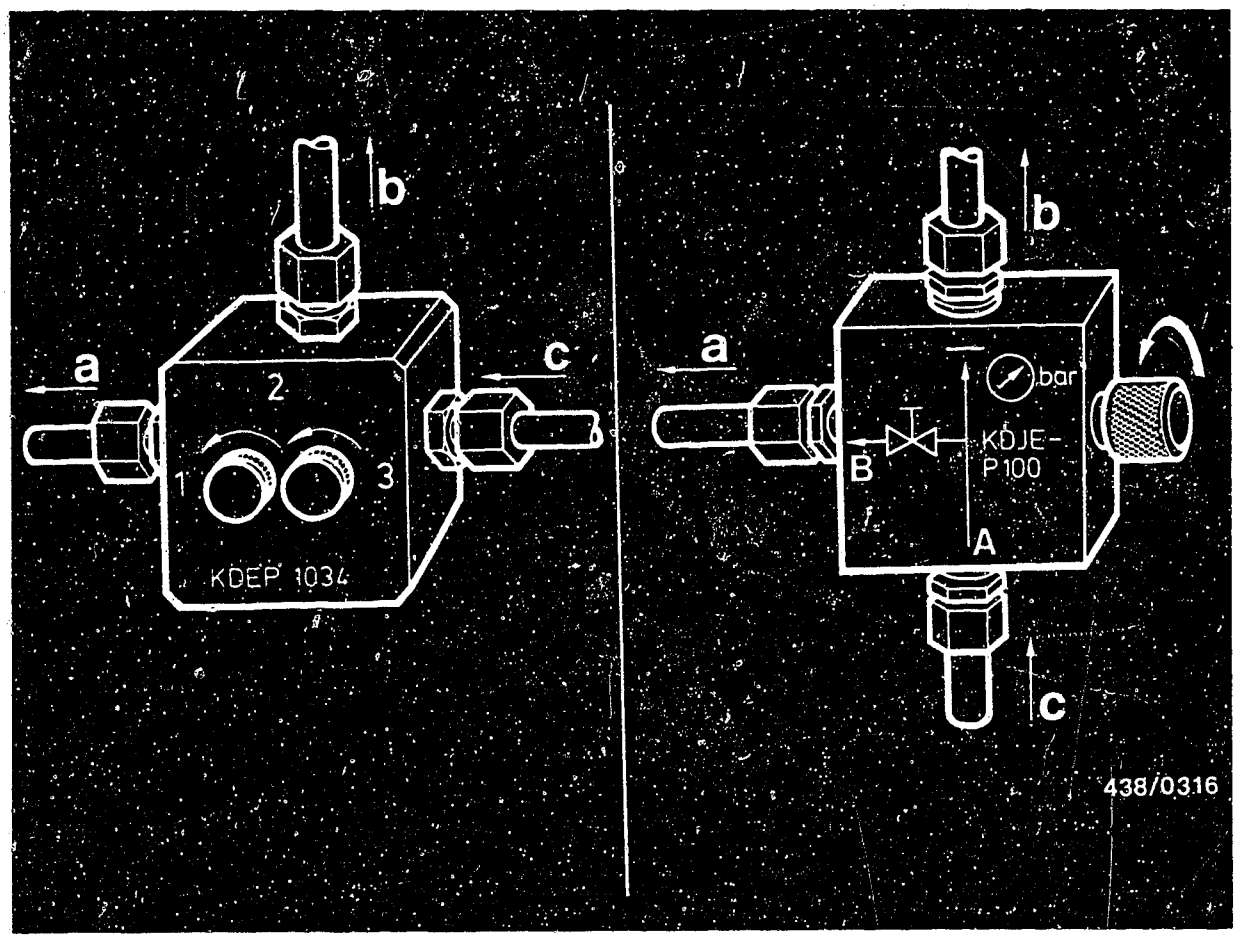
Connect the hose line (3) of the pressure tester to the control-pressure connection port (4) of the fuel distributor.

Suspend the pressure gauge from the hood (possibly using a wire hook).



16.2 Bleeding the pressure tester:

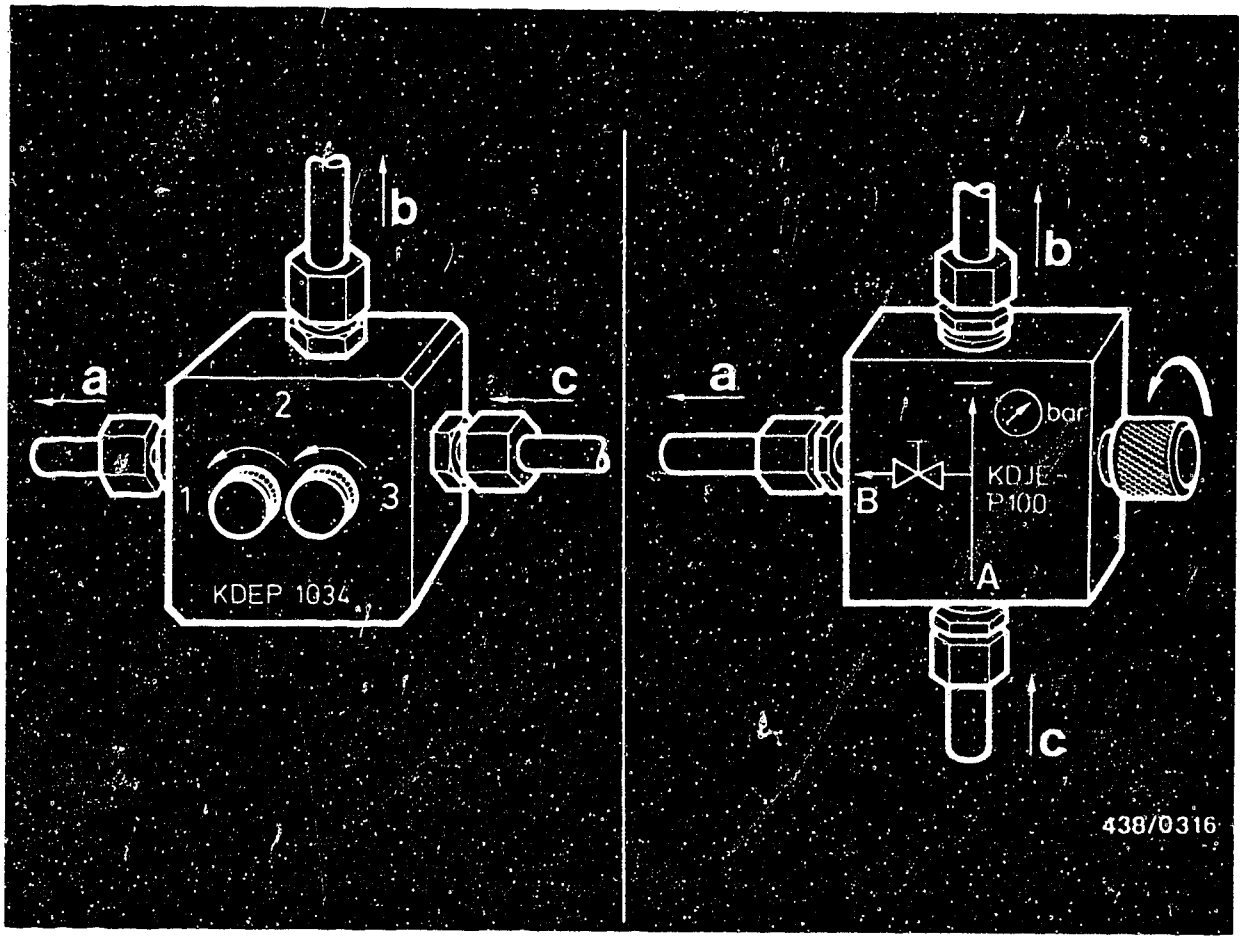
Disconnect the electric plug from the warm-up regulator and the auxiliary-air valve.
Let the pressure gauge hang down (hose fully extended).
Switch on the electric fuel pump by bridging the electrical safety circuit.
Open and close the valve screw of the directional-control valve (valve screw 1 in the case of KDEP 1034) in a 10-second rhythm about 5 times. Then hang the pressure gauge from a suitable support (e.g. from one of the struts under the engine hood).
Open valve screw of directional-control valve (both screws in the case of KDEP 1034) (turning to the left).



a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

16.3 Leak test

The test is performed with the engine switched off. Make the test with a warm engine but not immediately after the engine has been operated at a high temperature.
Open the valve screw of the directional-control valve (both valves in the case of KDEP 1034).

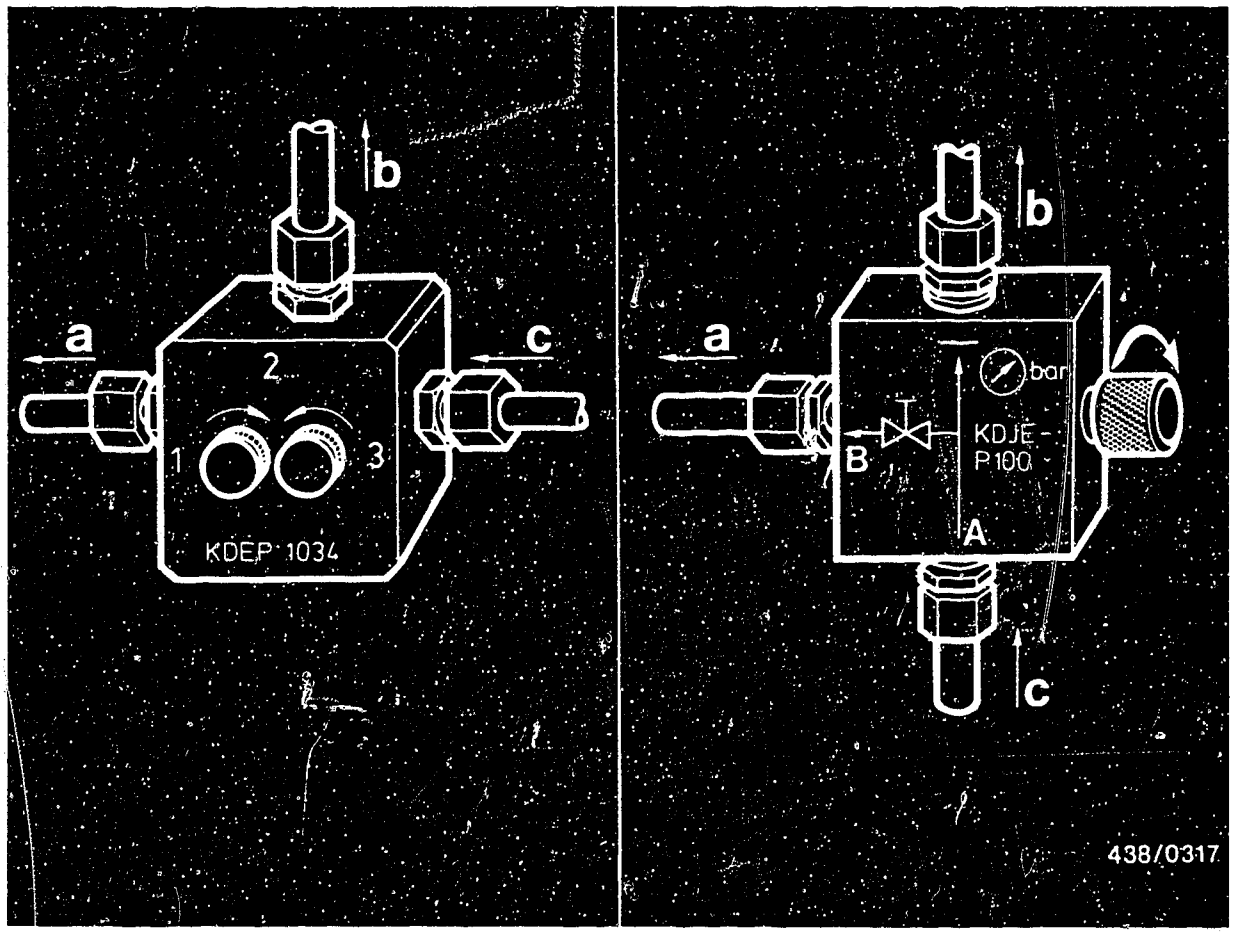


Switch on the electric fuel pump by bridging the electrical safety circuit until the warm-up regulator has ceased to operate ("warm" control pressure).

Switch the electric fuel pump off again and observe the drop in pressure on the pressure gauge.
Test specifications for leak test:

Minimum pressure after:

10 minutes: 1,7 bar (1,8 kgf/cm²) gauge pressure
20 minutes: 1,5 bar (1,6 kgf/cm²) gauge pressure

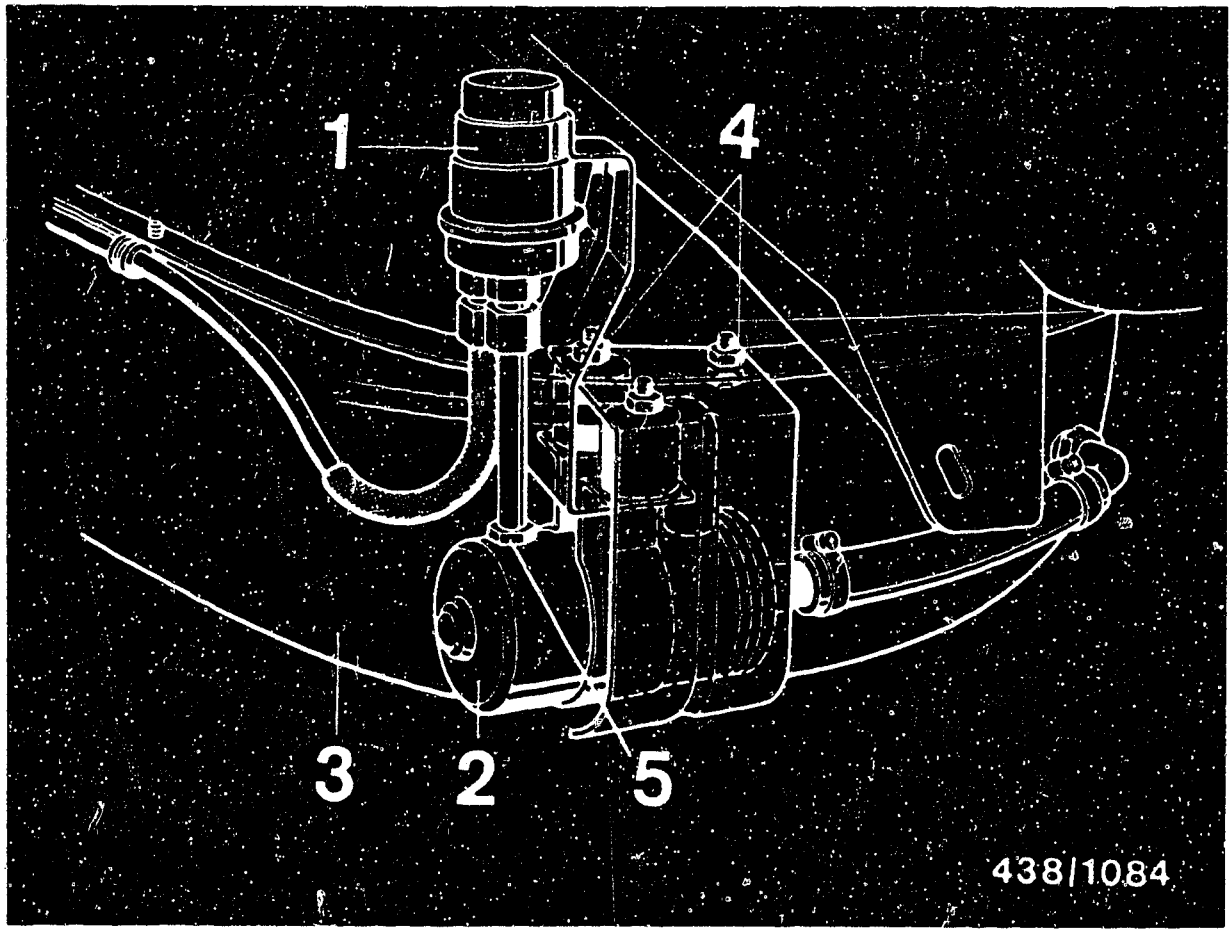


a = To warm-up regulator
b = To pressure gauge
c = From fuel distributor

If the pressure drops too quickly, repeat the test with the control-pressure circuit disconnected.

Position of the valve screws:
Close the valve screw of the directional-control valve KDJE-P 100.
In the case of KDEP 1034, close valve screw 1, open valve screw 2.

If the same result is found, the leak is in the primary-pressure circuit.
If the test results are correct during the second test, the leak is in the control-pressure circuit.



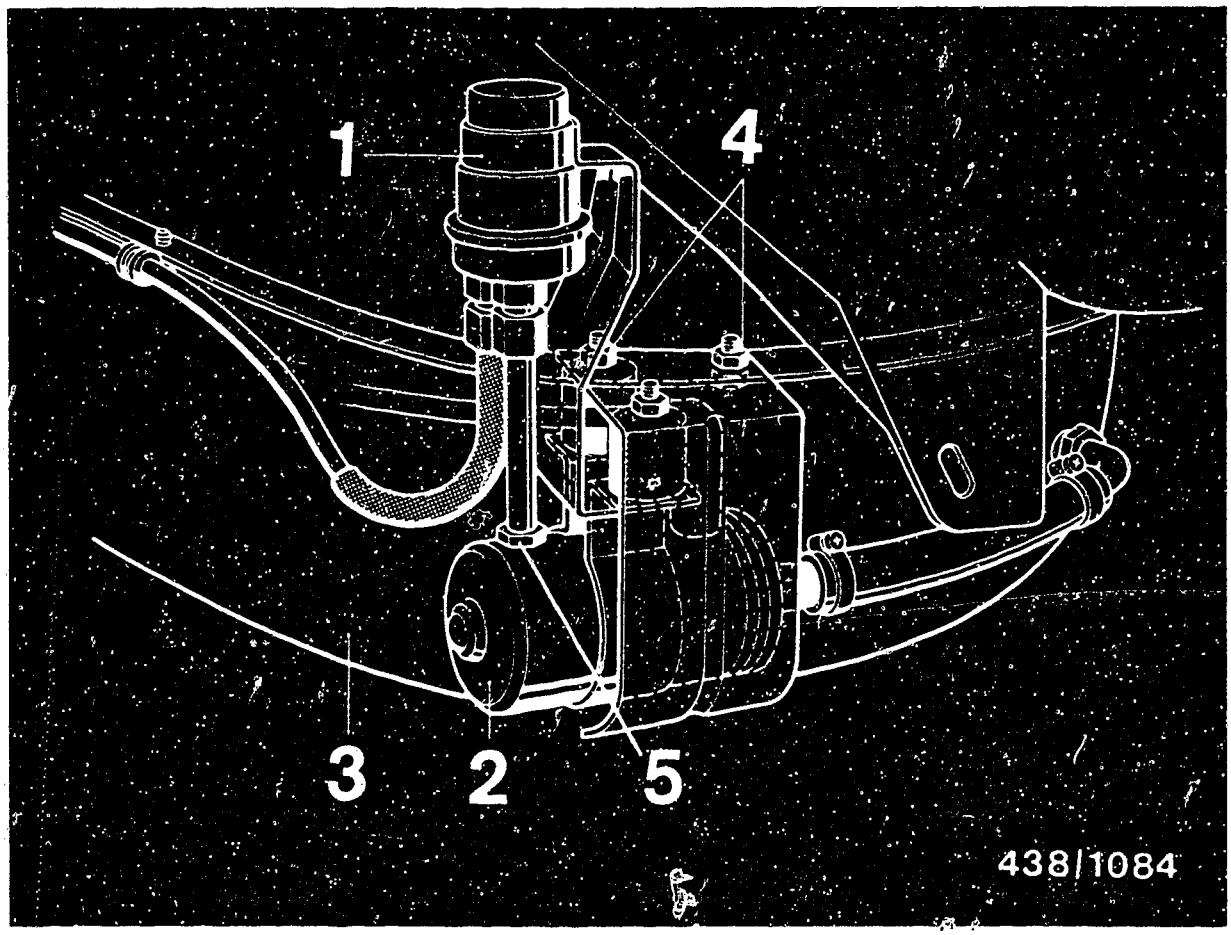
1 = Fuel accumulator
2 = Electric fuel pump
3 = Fuel tank
4 = Fastening nuts of bracket
5 = Delivery fitting with integrated non-return valve

16.4 Possible causes of faults in the primary-pressure circuit:

- Non-return valve in the tube fitting of the electric fuel pump leaking.

Part No. of electric fuel pump:	0 580 254 996
Part No. of non-return valve:	1 583 386 011
Special seal ring:	1 580 203 001

The non-return valve is integrated in the tube fitting on the delivery side of the pump. If leaking, replace the tube fitting.



1 = Fuel accumulator
2 = Electric fuel pump
3 = Fuel tank
4 = Fastening nuts of bracket
5 = Delivery fitting with integrated non-return valve

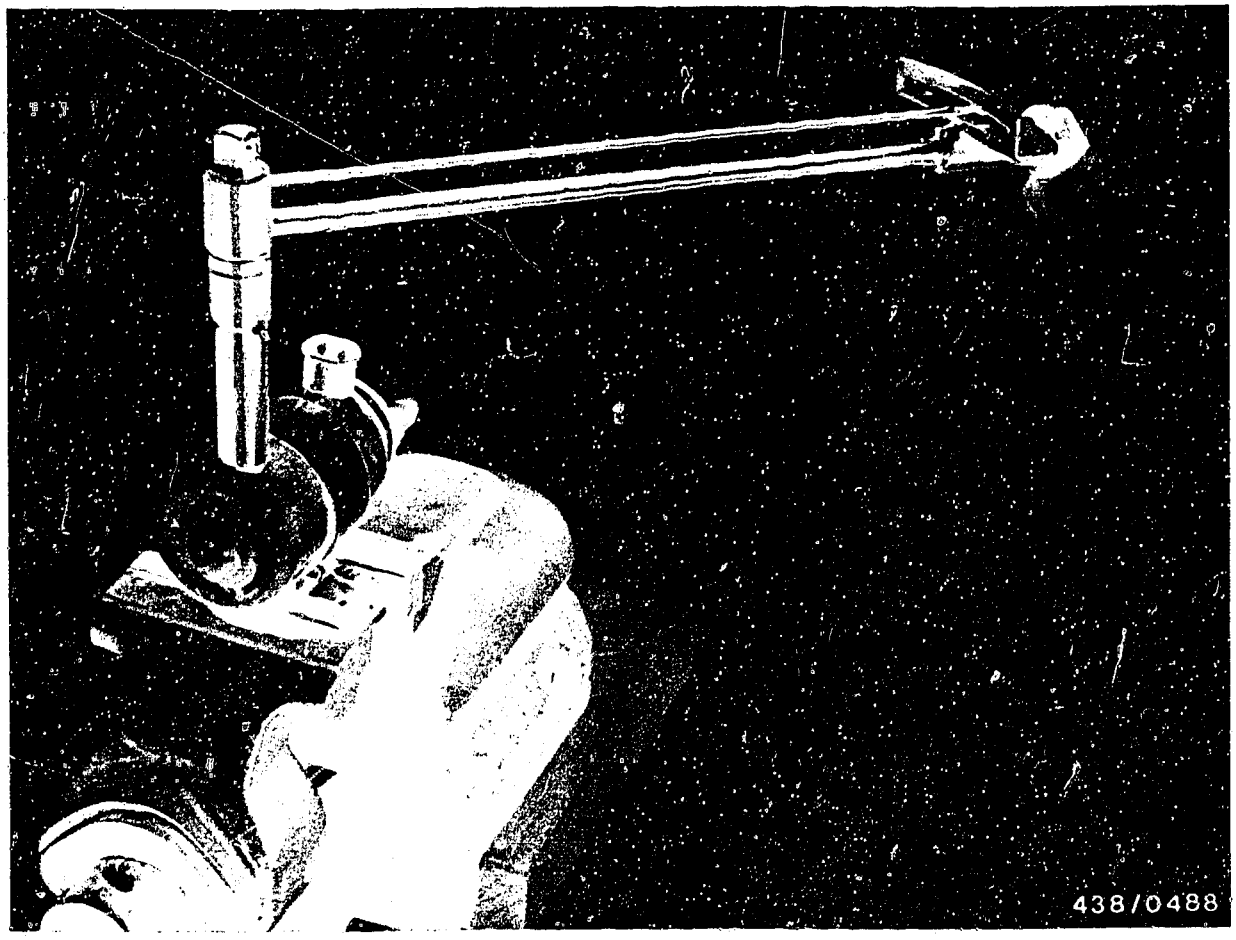
The electric fuel pump must be removed in order to replace the non-return valve. To do this, pinch off the intake hose before loosening (e.g. using hose clamper W 157 from Matra Co.) and remove complete bracket for electric fuel pump and fuel accumulator.

Unscrew delivery line from fuel accumulator and remove electric fuel pump from bracket.

Note: Replacing the electric fuel pump requires a new delivery line to the fuel accumulator. This requires a new 45 mm long piece of polyamide line, 8 mm inside diameter, for pressures of at least 25 bar.

Using a soldering iron, cut open the old line in the region of the delivery fitting (non-return valve) and of the screw nipple and remove.

Caution: Never use an open flame for heating the line. Danger of fire!
Cutting open the line with a knife is likewise not advisable because the tooth section of the fittings will be damaged.



Clamp the pump in a vice by the clamping band (never clamp by pump housing).
Unscrew fitting.

Caution: No dirt or chips must get into the inside of the pump.

Always screw in a new tube fitting with a new seal ring. Tightening torque 16...20 Nm (1.6...2.0 kgfm).

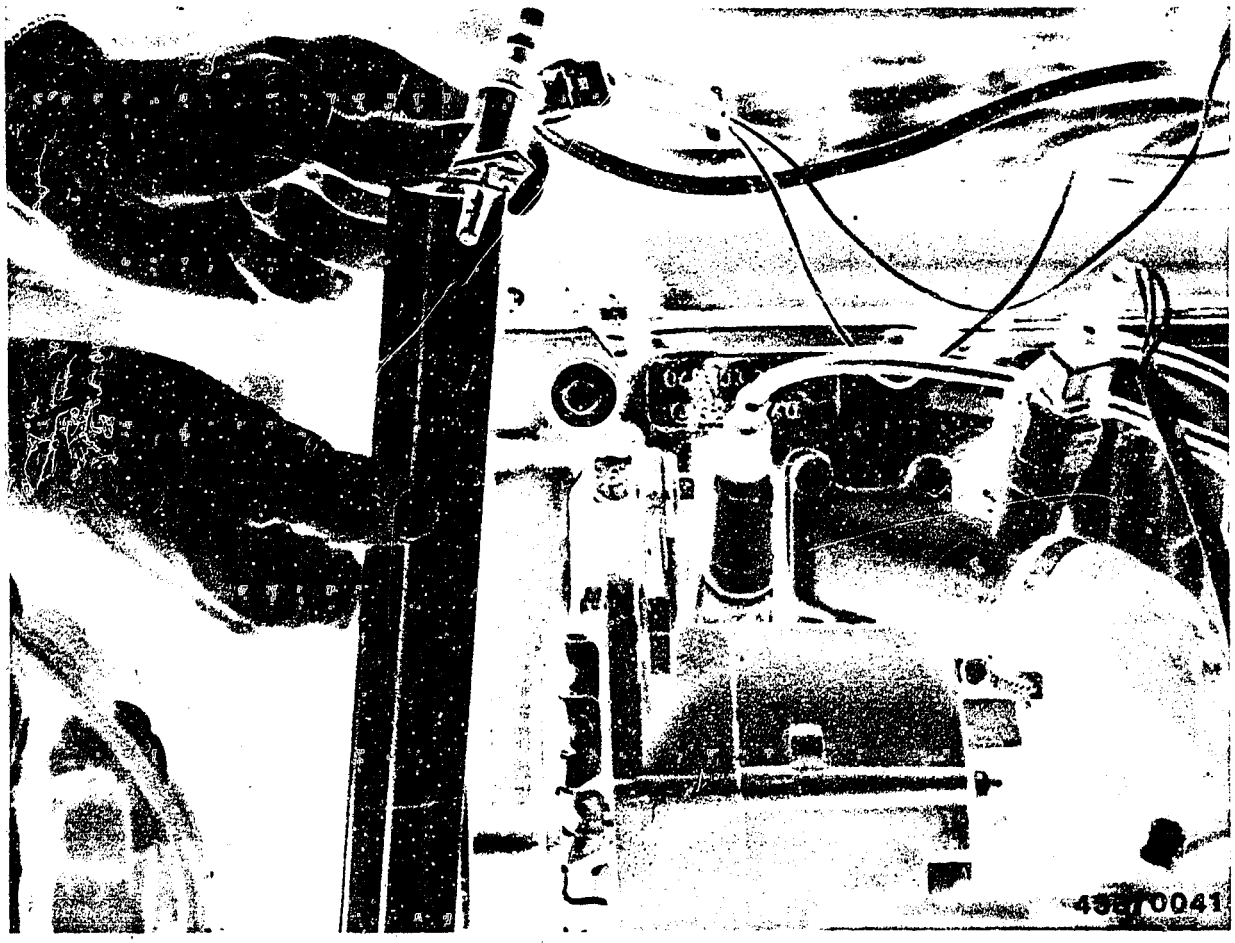
Caution: Use only the specified seal ring, since it is of special dimensions. Always observe the specified tightening torque and do not exceed, otherwise there is the danger of warping the housing and damaging the thread.

Insert the new hose line into the assembly tool KDEP 1309 so that it projects by the amount of the length of the nipple. Clamp the assembly tool in a vice and knock the screw nipple cold into the line using a clean plastic mallet.

Clamp the other end of the delivery line in the same manner in the assembly tool and press cold onto the delivery fitting of the electric fuel pump.
Hold the electric fuel pump when doing this - do not clamp in a vice.

Important: Do not heat the line for pressing on since it will undergo permanent expansion, which will lead subsequently to leaking.

Re-install the electric fuel pump. Remove the hose clamper from the intake hose and finally check all connection for leaks with the electric fuel pump operating.



Further possible cause of leaks in the primary-pressure circuit:

- Start valve leaking.

Remove the plug from the start valve and remove the start valve. The fuel line remains connected.

Hold the start valve in a suitable vessel (e.g. a graduate).

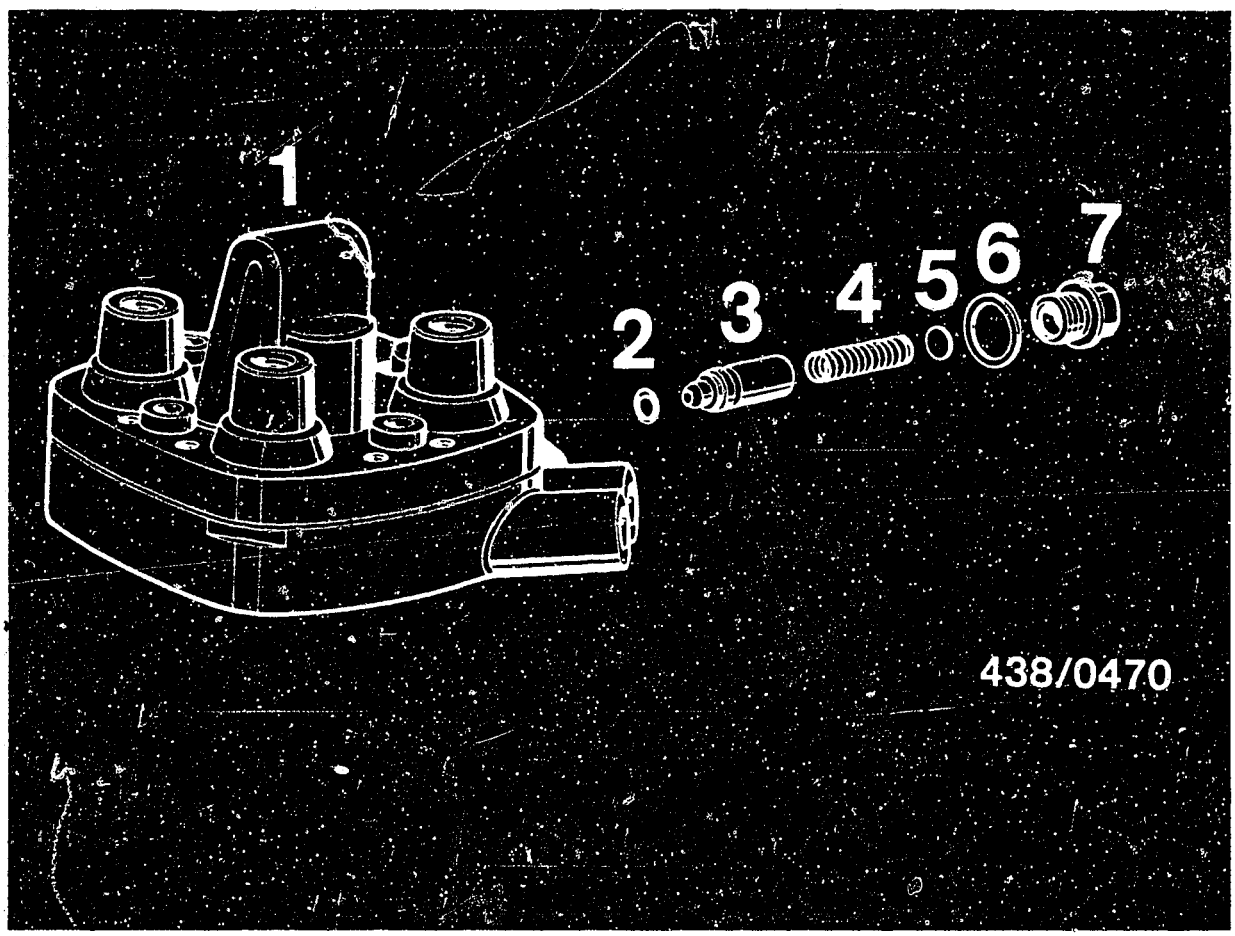
Switch on the electric fuel pump by bridging the electrical safety circuit so that primary pressure is applied to the start valve.

Dry off the nozzle of the cold-start valve.

No drops must fall from the nozzle of the start valve within the next minute. Even when shaken and knocked, the start valve must not leak.

Switch the electric fuel pump off again.

Replace the cold-start valve if leaky.
Finally, adjust idle speed with the engine at operating temperature.
Idle-speed adjustment is described on Coordinates F 6.



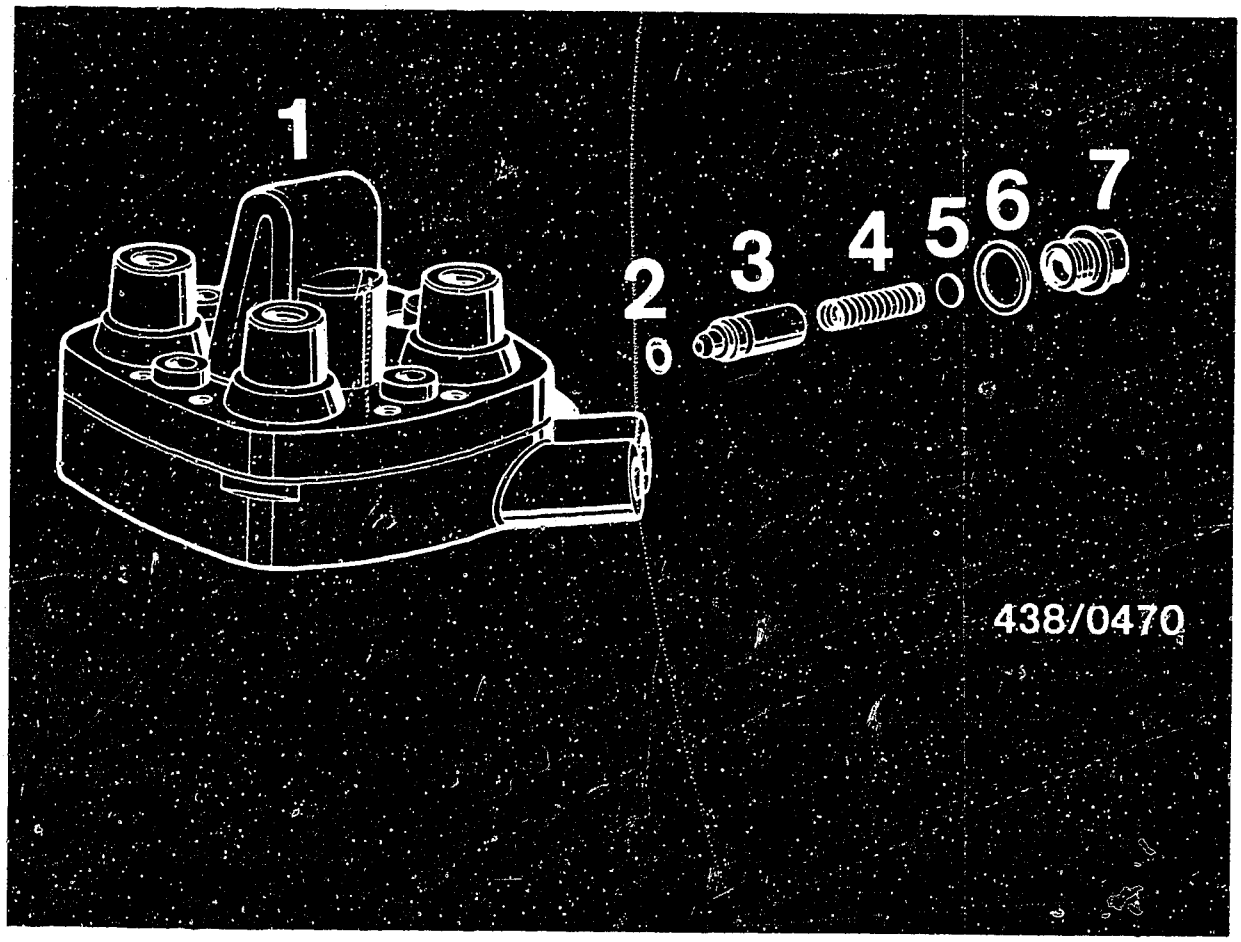
1	=	Fuel distributor	5	=	Shim(s)
2	=	O-ring	6	=	Flat seal ring
3	=	Control piston	7	=	Screw plug
4	=	Control spring			

Further possible cause of a leak in the primary-pressure circuit:

- Control-piston seal ring (O-ring) of the primary-pressure regulator has a leak.

Replace seal ring:
Clean fuel distributor in the region of the primary-pressure regulator.

Screw out screw plug (pay attention to shims), remove control spring and control piston.



1 = Fuel distributor
2 = O-ring
3 = Control piston
4 = Control spring
5 = Shim(s)
6 = Flat seal ring
7 = Screw plug

Replace seal ring (O-ring) (7) on control piston (5), install control piston and spring (6).

Finally, check the primary pressure and, if necessary, adjust by changing the shims (5).
Primary pressure:
Fuel distributor 0 438 100 003, 0 438 100 005
Checking value 4.5...5.2 bar (4.6...5.3 kgf/cm²) gauge pressure
Setting value 4.7...4.9 bar (4.8...5.0 kgf/cm²) gauge pressure

16.5 Possible cause of trouble in control-pressure circuit:

Fuel distributors 0 438 100 003 and ... 005 are versions without push-up valve. Therefore, the only possible cause of a leak in the control-pressure circuit is the warm-up regulator. Replace the warm-up regulator.

Note on replacing warm-up regulator 0 438 140 002 in the 1974 model (Type 140..):

In case of replacement, only warm-up regulator 0 438 140 004 of the 1975 model is available. So that the original hose line for fuel inlet can remain in the vehicle, a fitting 1 437 000 000 is required. This is screwed into the inlet connection of the warm-up regulator 0 438 140 004.

Notes on removing the polyamide line from the defective warm-up regulator:

Using a soldering iron, cut open the fuel line in the region of the fitting and pull off.

Caution: Never use an open flame for heating the line. Danger of fire!

Cutting open the line with a knife is likewise not advisable if only the line is to be replaced and the fitting is to be used again. The tooth section of the fitting would be damaged, which may lead subsequently to leaks.

Mounting the line:

Cut off the section of the line which has been cut open.

Insert the line into assembly tool KDEP 1039 so that it projects by the amount of the length of the fitting.

Press the line cold into the fitting.
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which many lead subsequently to leaking.

When the warm-up regulator has been replaced or a fault remedied, it is necessary to carry out the idle adjustment with the engine at normal operating temperature.

Idle adjustment is described on Coordinates F6.

17. Testing the injection valves.

Remove the injection valves for testing. They are inserted into appropriate bores in the cylinder head and are located by holding plates (arrow).

Unscrew the fuel lines. Screw out the fastening screws. Lift off the holding plates and remove the valves from the bores.

When re-installing the injection valves, the shaped rubber seal on the valve stem should be replaced if possible (Volvo service part) in order to prevent leaks and thus the entry of unmetered air.

17.1 Test equipment and test media

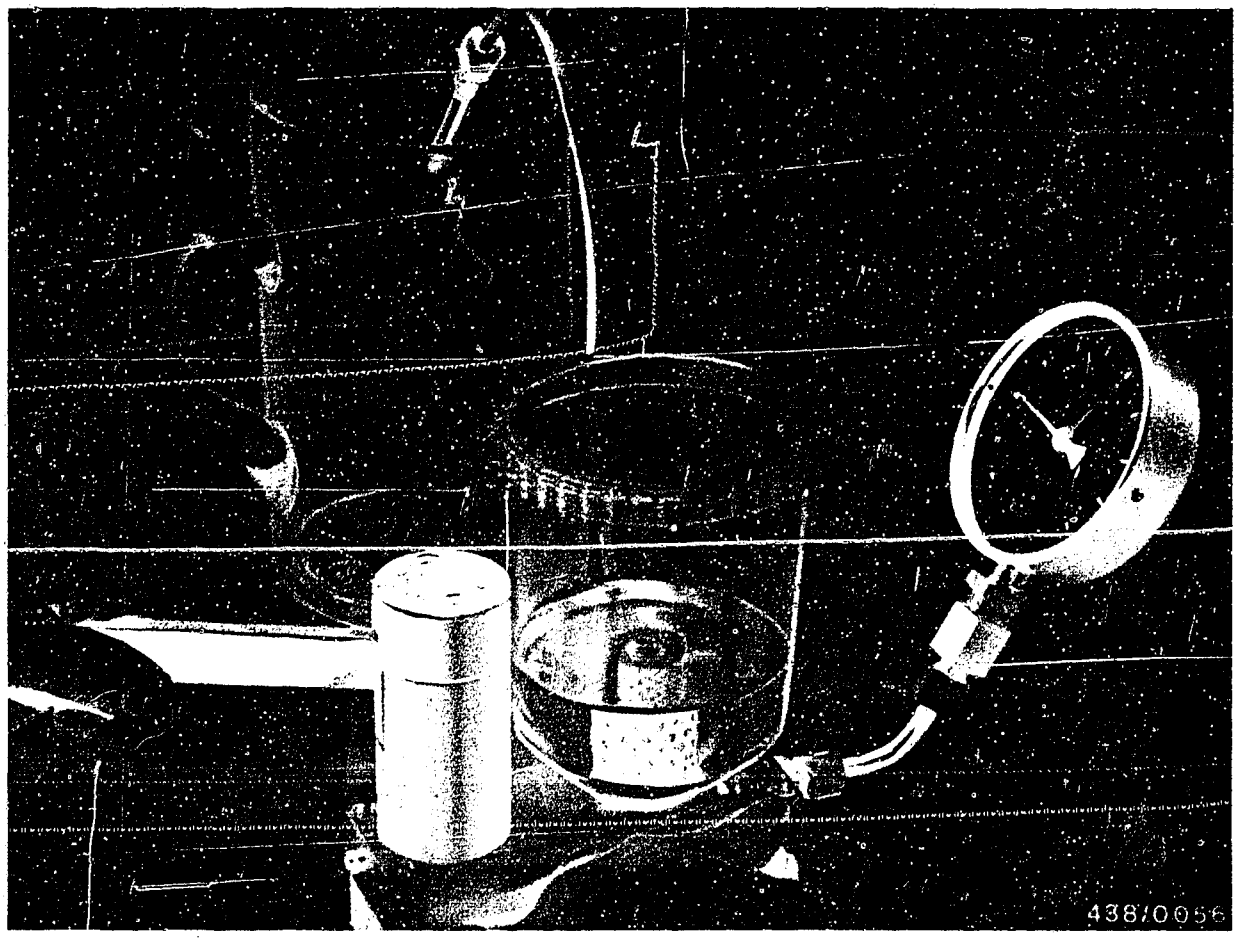
The following testing specification refers to valve testers KDJE-P 400 (previously KDEP 7452) and 0 681 200 700.

Observe the test-media specification!

Test media: Calibrating fluid (Shell K 30, Esso-Varsol, Shell Mineral Spirits 135)
or
Bosch, Part No. VS 14 942-CH
Former Part No. 5 973 340 650
The calibrating fluid can be obtained in 5 l metal cans from the following supplier:

Firma
Oskar Gnamm GmbH
D-7531 Kämfelbach-Bilfingen

Caution:
For safety reasons, never use normal gasoline or similar easily inflammable and combustible liquids.
Even with calibrating fluid, be sure to observe the local official regulations.

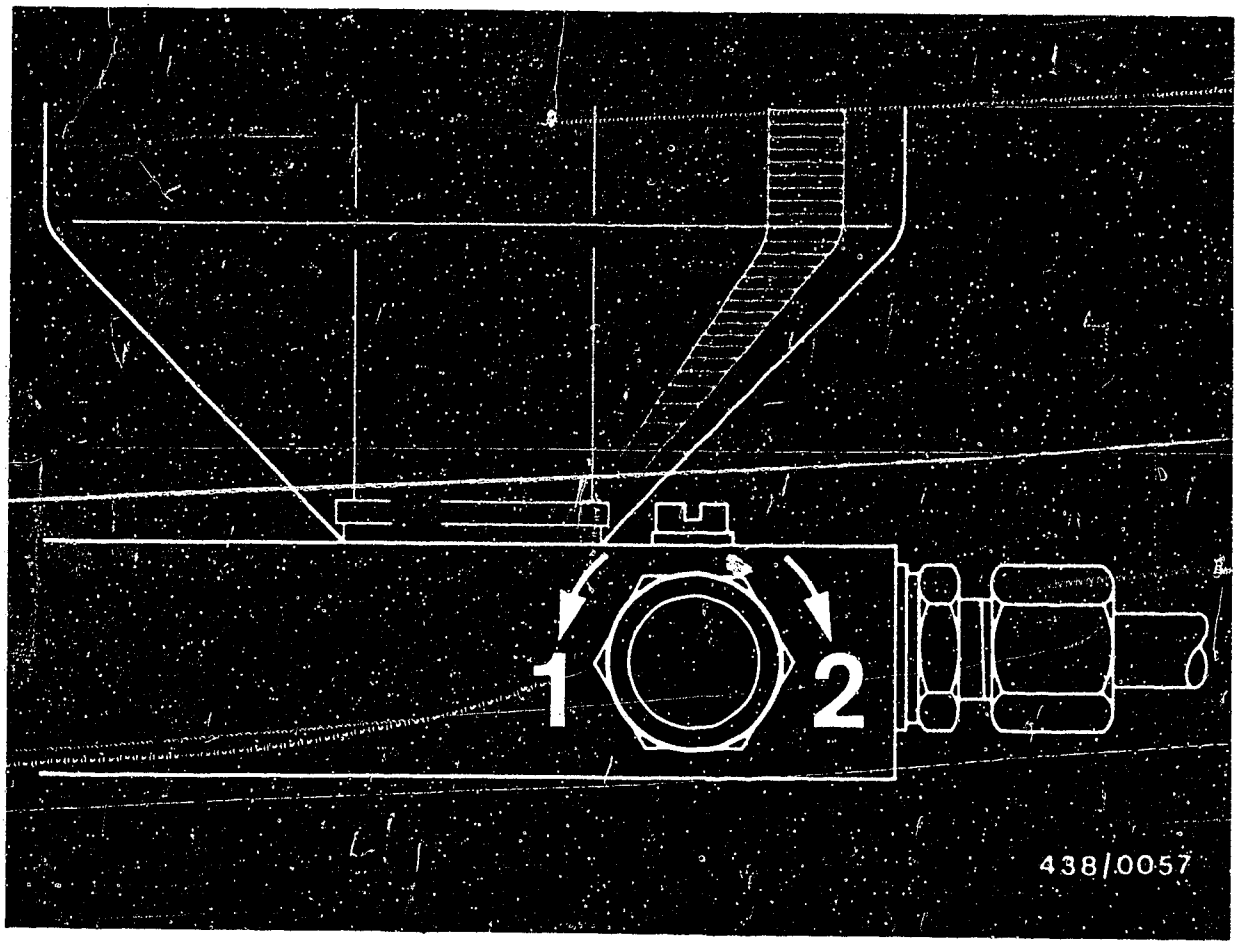


17.2 Connecting the injection valve to the tester

Connect the injection valve to the valve tester and bleed the delivery line by operating the lever several times with the union nut open. Then tighten the union nut.

17.3 Checking for dirt

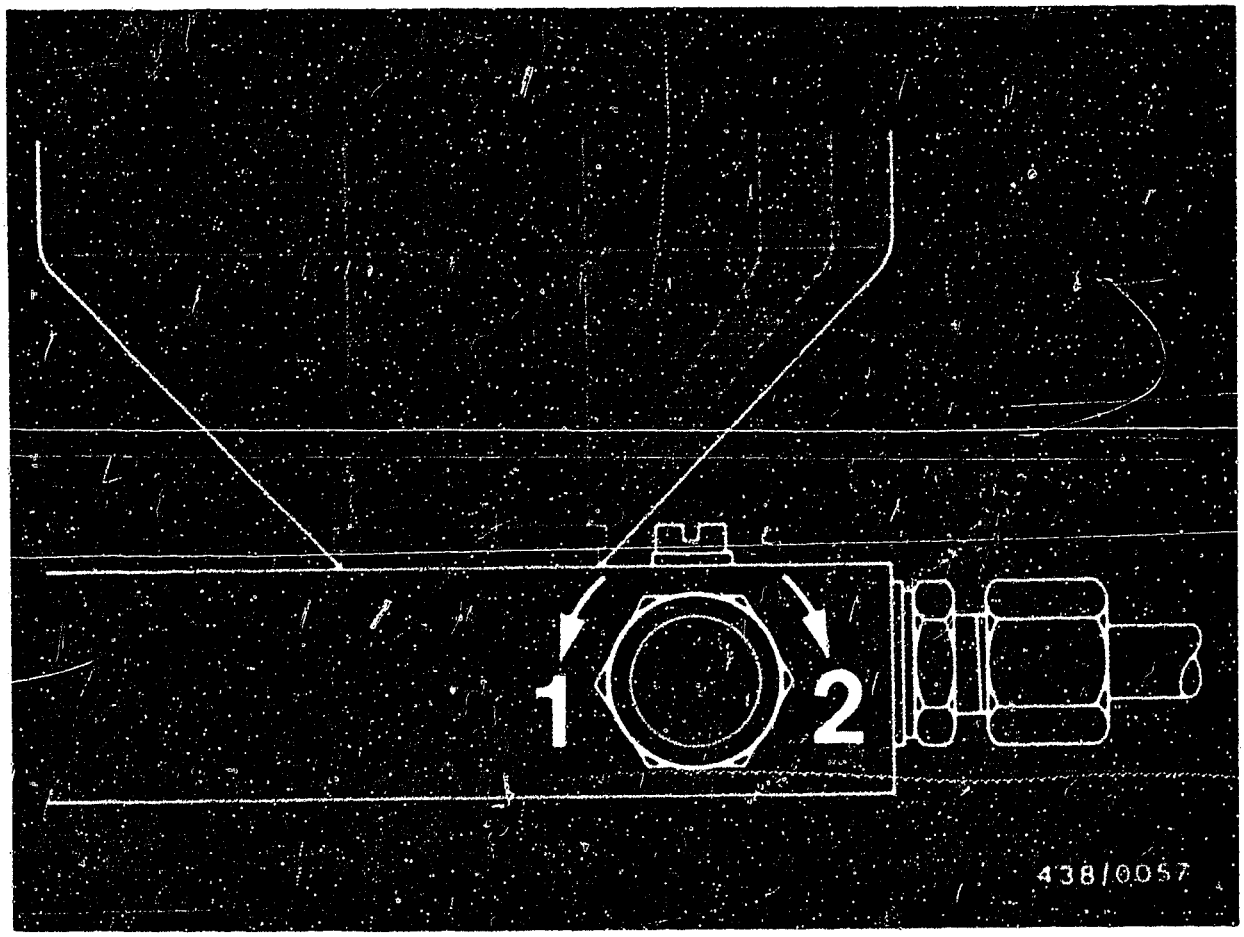
Move the hand lever slowly (about 2 seconds per stroke) back and forth with the stopcock on the pressure gauge open. If the pressure does not build up to 1...1.5 bar gauge pressure, the injection valve has a bad leak (caused, for example, by dirt stuck in it).
You can try to flush the injection valve clear by moving the lever back and forth several times strongly.
If this attempt is successful, continue the test. If it is not possible to flush the valve clear, replace it.



1 = Open 2 = Close

17.4 Testing the opening pressure

Injection valve Part No.	Test specifications - opening pressure (gauge pressure)
0 437 502 003	2,5...3,6 bar (2,6...3,7 kgf/cm²)

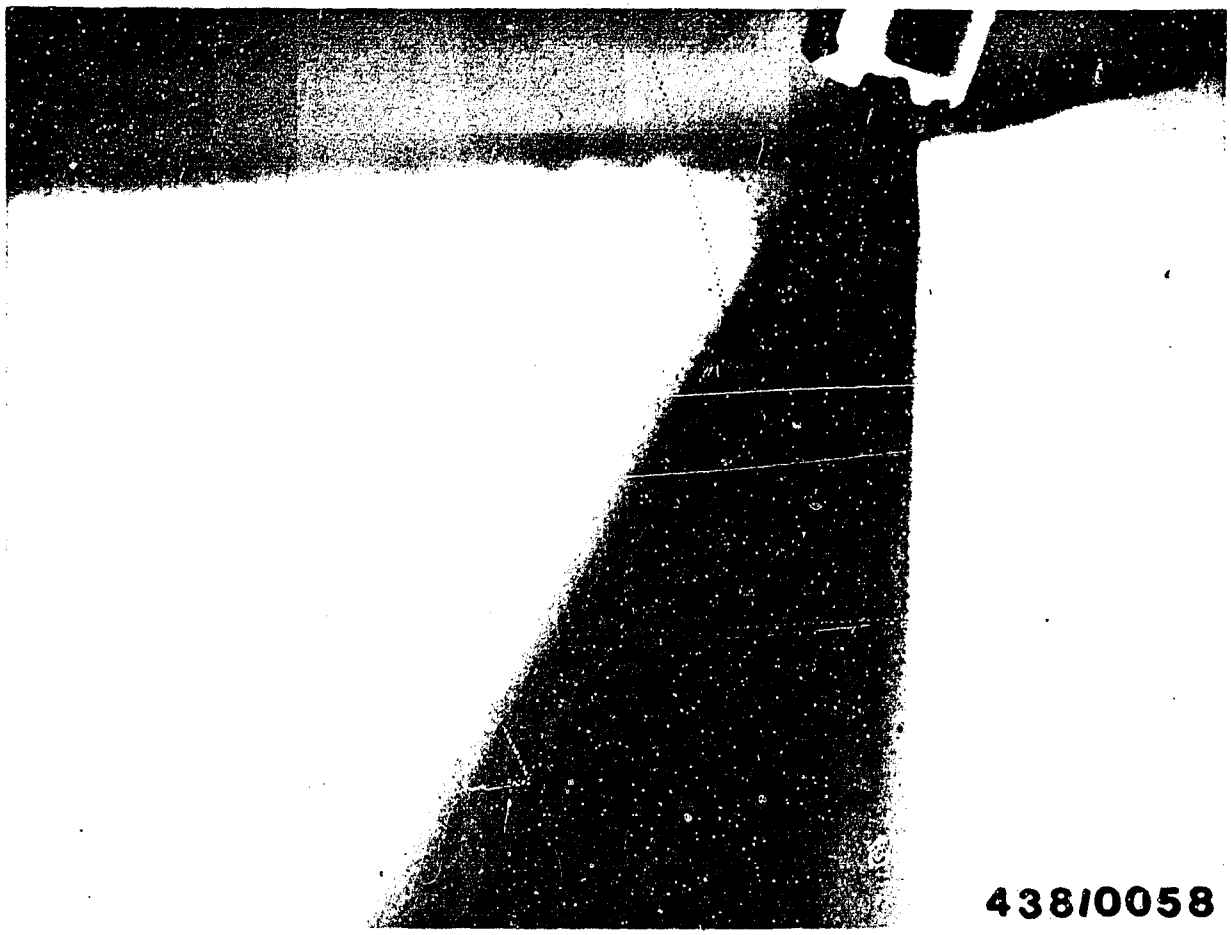


With the stopcock closed, flush the valve out and bleed it with several rapid movements of the lever.
Open the stopcock and test the opening pressure by moving the lever slowly (about 2 seconds per stroke).

If the opening pressure is outside tolerance, replace the injection valve. Individual valves can also be interchanged within a set.

17.5 Leakage test

Open the stopcock, build the pressure up slowly to a value 0.5 bar under the opening pressure determined previously (but not less than 2.8 bar gauge pressure), and hold it constant at that level. No drops must now fall from the valve for the next 15 seconds.



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17.6 Chatter test, evaluation of spray

Move the lever back and forth at about 1 stroke per second. As this is done, the valve must chatter. No drops of fuel must form at the mouth of the valve. The valve must not produce a "cord spray". Formation of a single-sided, atomized spray within an overall spray angle of about 35° is permissible (see example given in illustrations).

Illustration shows good spray formation.

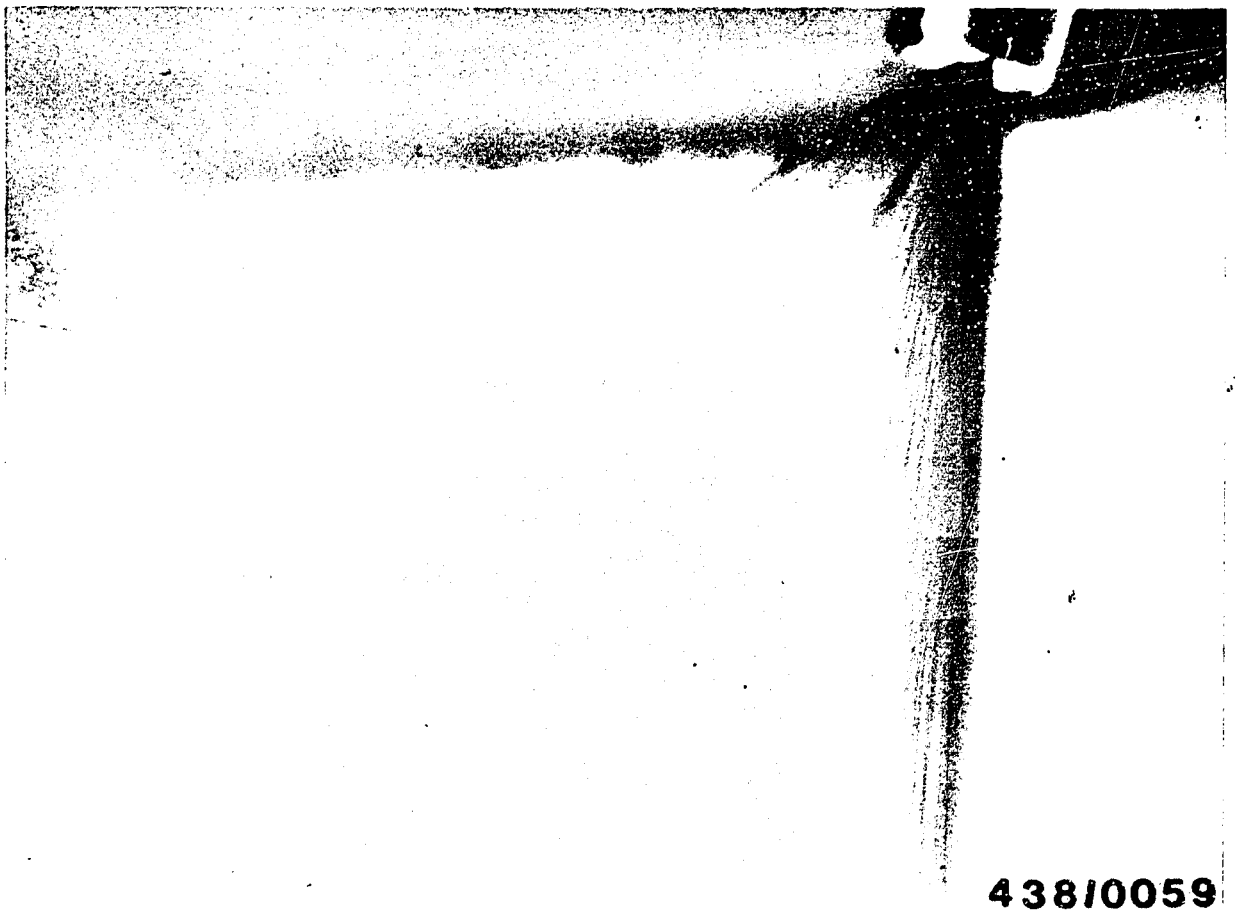
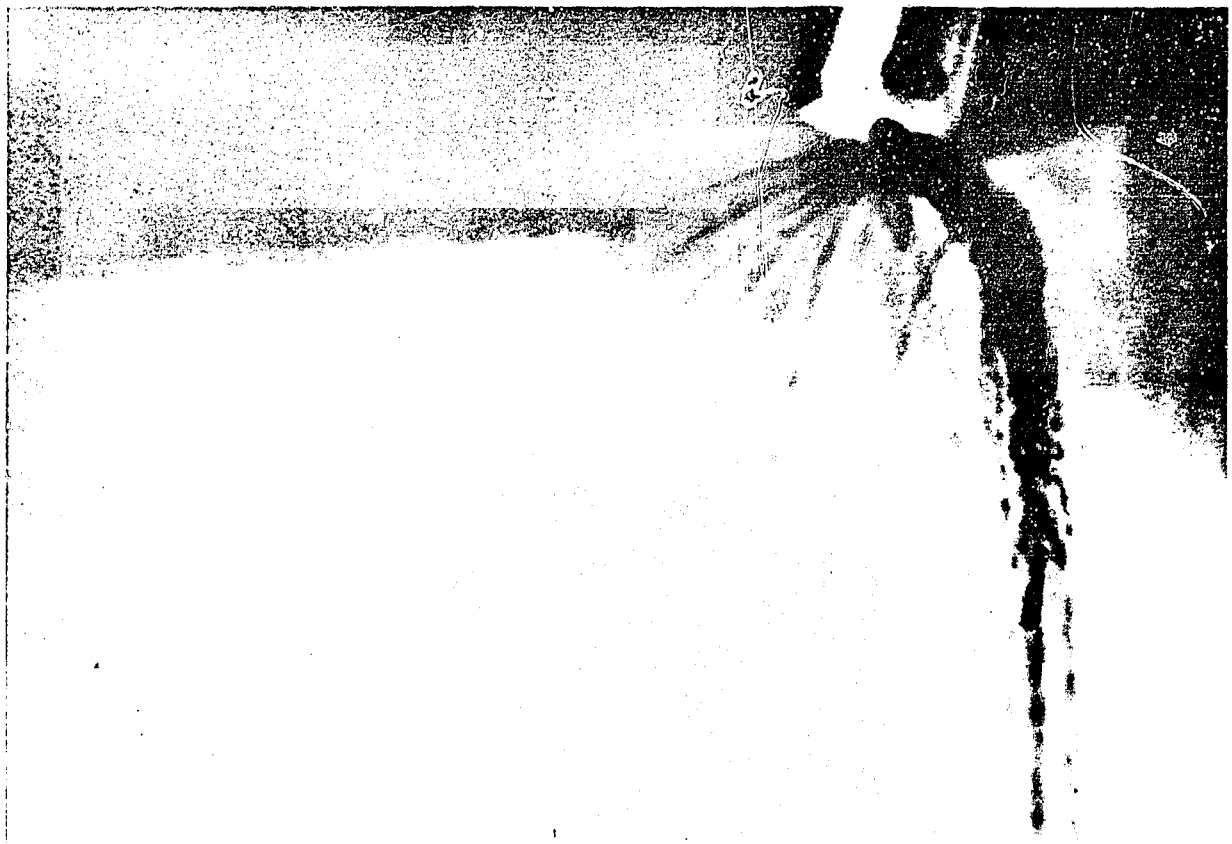


Illustration shows single-sided but nevertheless good spray formation.



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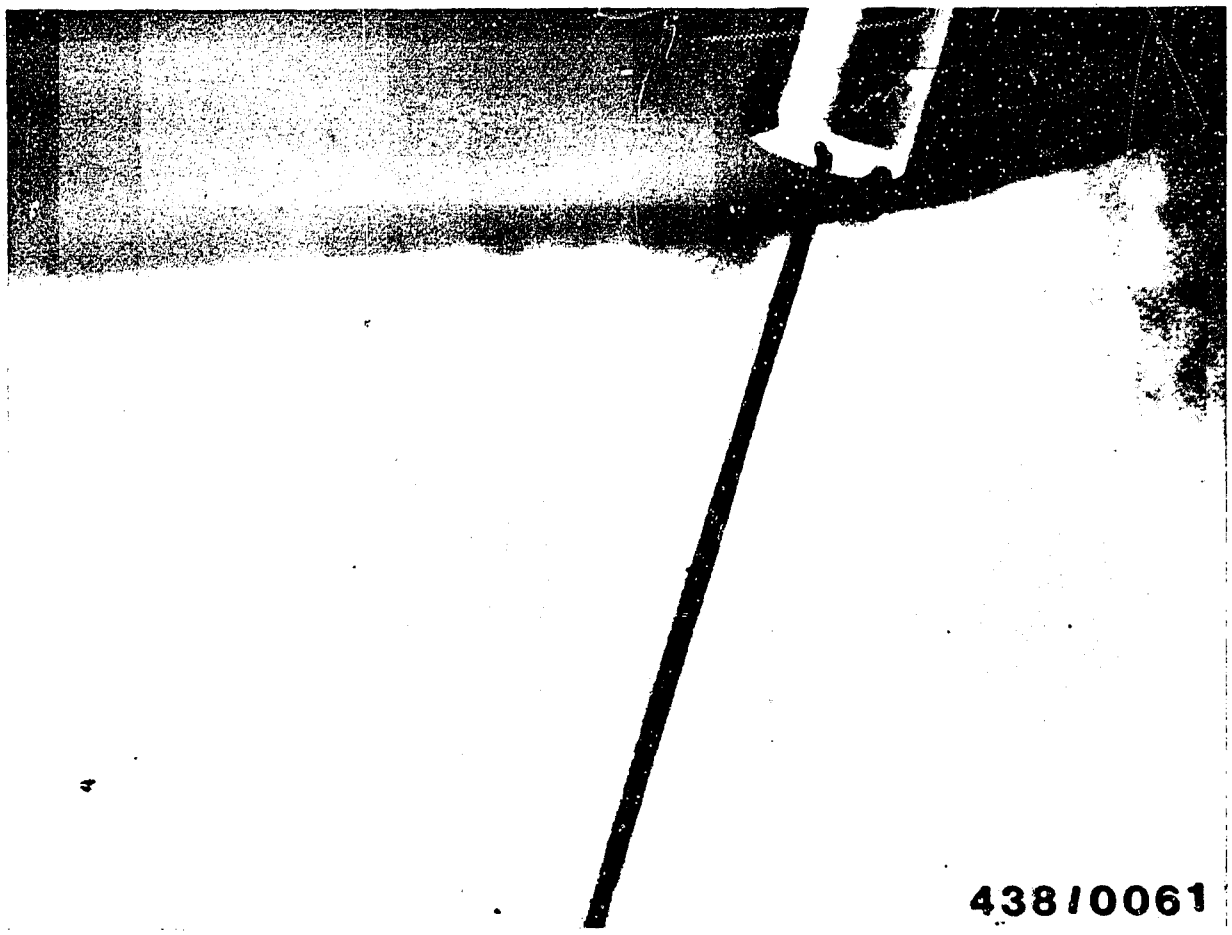
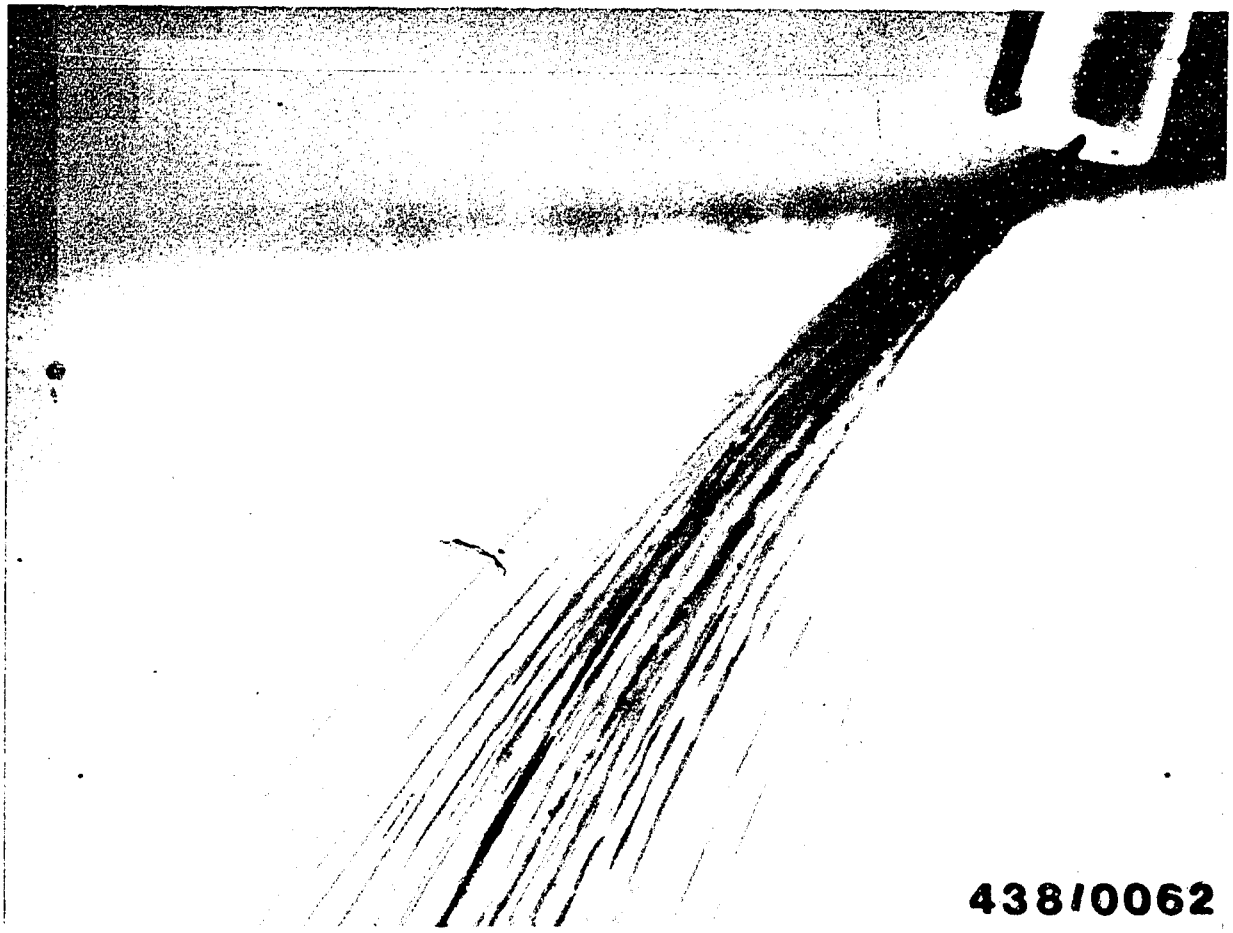
Poor spray formation; replace injection valves.

Illustration shows drop formation.



Poor spray formation; replace injection valves.

Illustration shows "cord" spray.

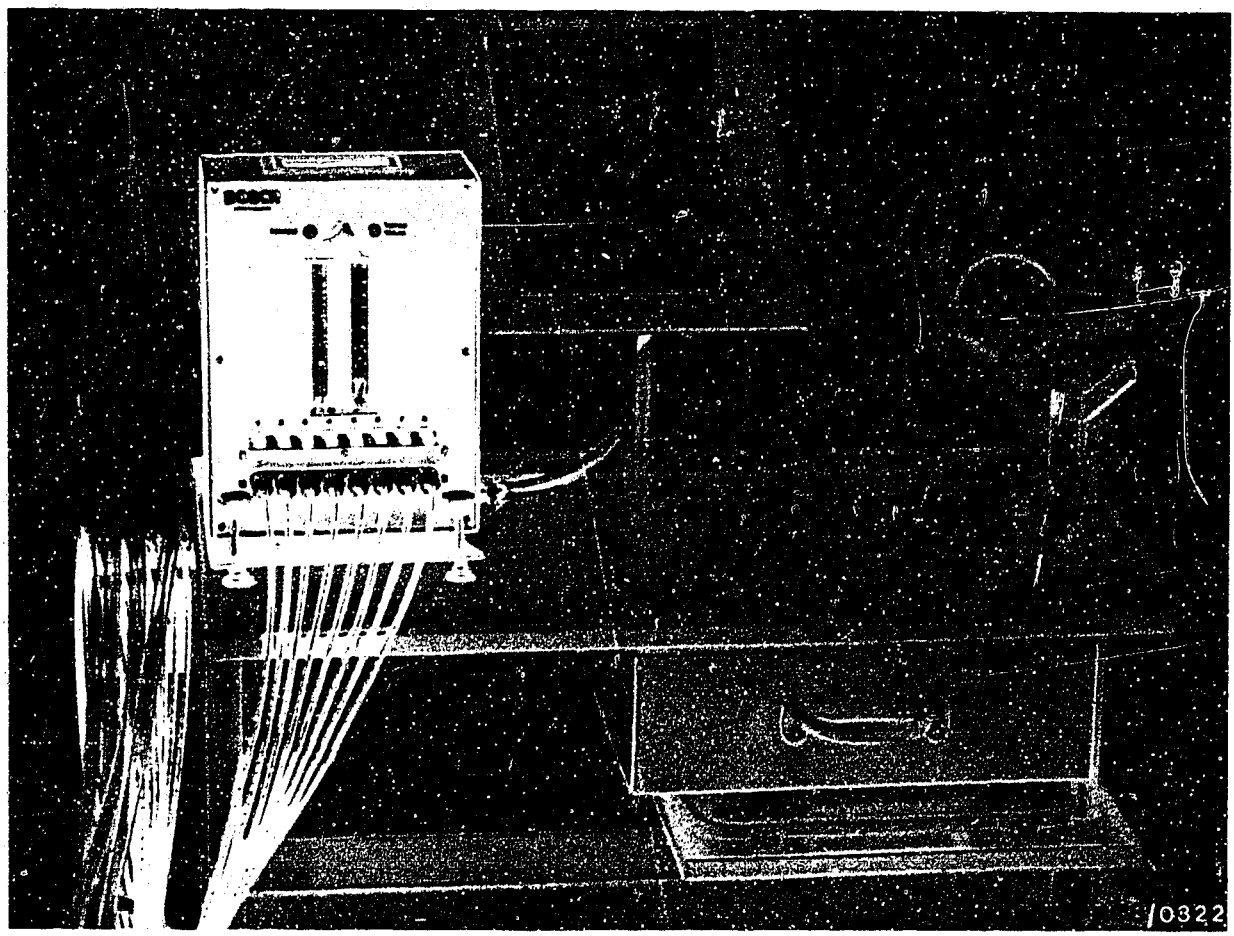


Poor spray formation; replace injection valves.

Illustration shows "spray in strands".

If defective injection valves have been replaced, it is necessary finally to adjust the idle speed with the engine at normal operating temperature.

Idle-speed adjustment is described on Coordinates F 6.

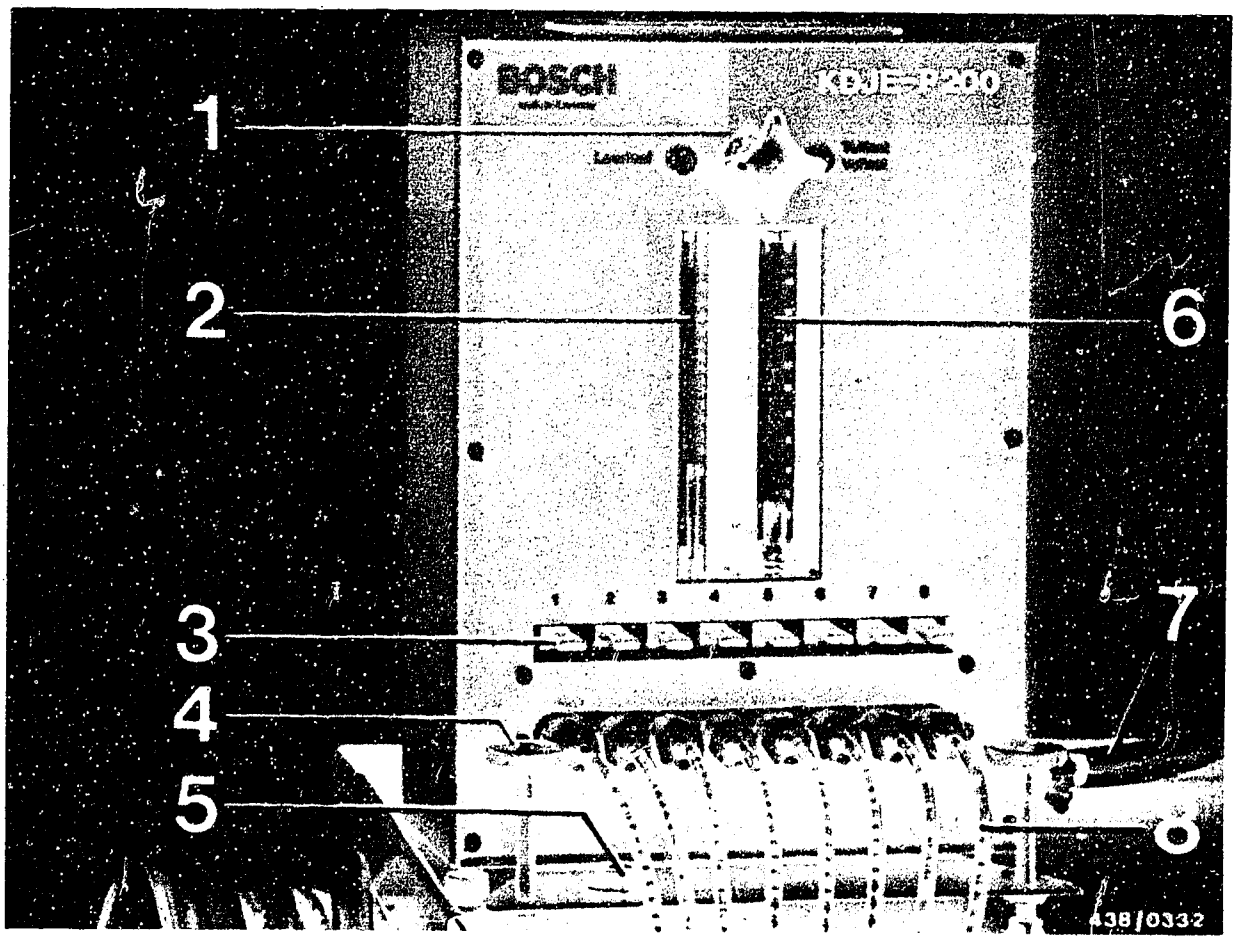


18. Comparative measurement of fuel delivery of fuel distributor outlets.

This test is carried out using the tester for delivered quantity comparison KDJE-P 200 (previously KDJE 7451).

18.1 Application

By means of comparative measurements, the differences in the amounts of fuel delivered from the individual outlets on the fuel distributor are determined.
The tester is designed so that the test can be made on the vehicle without having to remove the fuel distributor.
Since the test is made with the original injection valves, the operator can recognize at the same time whether delivered-quantity scatter, if it occurs, is caused by the fuel distributor or by the injection valves.



1 = 3-way cock
2 = Small rotameter tube
3 = Keyboard for 8-way valve
4 = Adjusting screw for setting up
5 = Spirit level
6 = Large rotameter tube
7 = Return hose
8 = Polyamide hose lines (test lines)

18.2 Construction

The tester is designed for use with all engines, up to 8 cylinders, equipped with K-Jetronic.

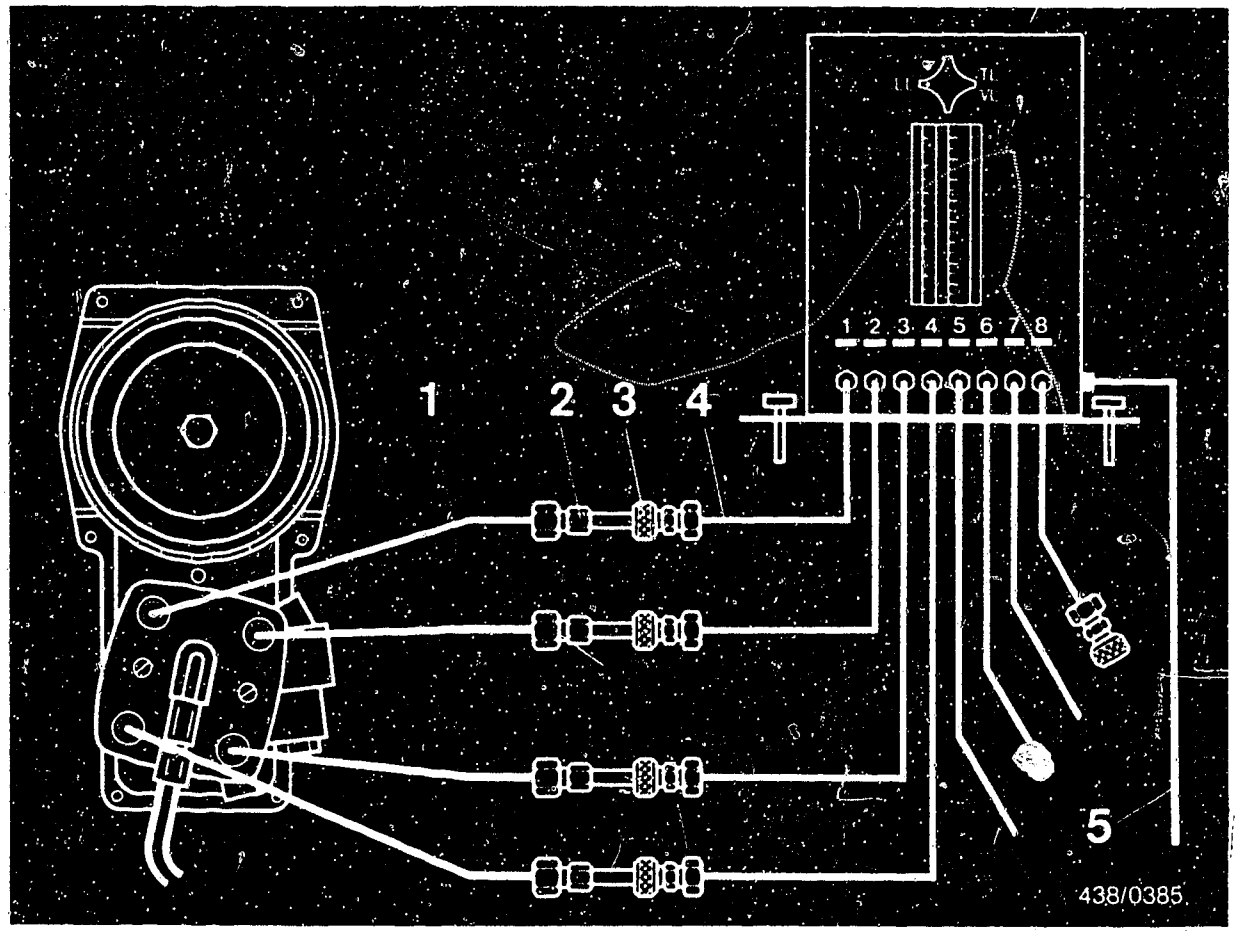
Basically, the tester consists of a steel housing containing 2 rotameter tubes with measuring ranges of 2...15 cm^3 and 10...180 cm^3, an 8-way valve for key operation (Item 3) and a 3-way stopcock (Item 1).

The small rotameter tube (Item 2) is used for the idle measurement while the large tube (Item 6) is used to measure the fuel delivery at part- and full-load. The particular rotameter tube to be used is connected by means of the 3-way stopcock. Using the 8-way valve, the fuel delivery of each cylinder is tested one after the other.

Attached to the tester are 8 hoses (Item 8), each terminated with an automatic connector. When the injection valves are withdrawn from their sockets on the engine they are attached to these connectors. Each automatic connector is fitted with a push valve so that no fuel can escape from connectors that are not in use (when 4- or 6-cylinder systems are tested).

The fuel is returned to the fuel tank through a hose (Item 7) about 5 m long.

The entire test is made with a closed circuit, i.e. no fuel escapes.



1 = Fuel distributor injection tubing
2 = Injection valves
3 = Automatic connectors
4 = Tester hoses
5 = Return line to fuel tank filler neck

18.3 Setting up and connecting the tester:

Set the tester up beside the engine on a solid base (e.g. on tester trolley KDJE-W 100) and align it with the built-in spirit level at the base of the tester.

Remove injection valves; the injection tubing remains connected.
Clean the injection valves with a rag and insert injection valves in correct sequence into the automatic connectors of the first four tester hoses.

Note:
Insert the injection valves as far as they will go and tighten the knurled thumbscrews well so that the non-return valves of the automatic connectors are open fully.
Introduce the return hose of the tester into the fuel tank filler neck.

18.4 Bleeding the tester:

Remove the rubber hood so that air-flow sensor plate becomes accessible.

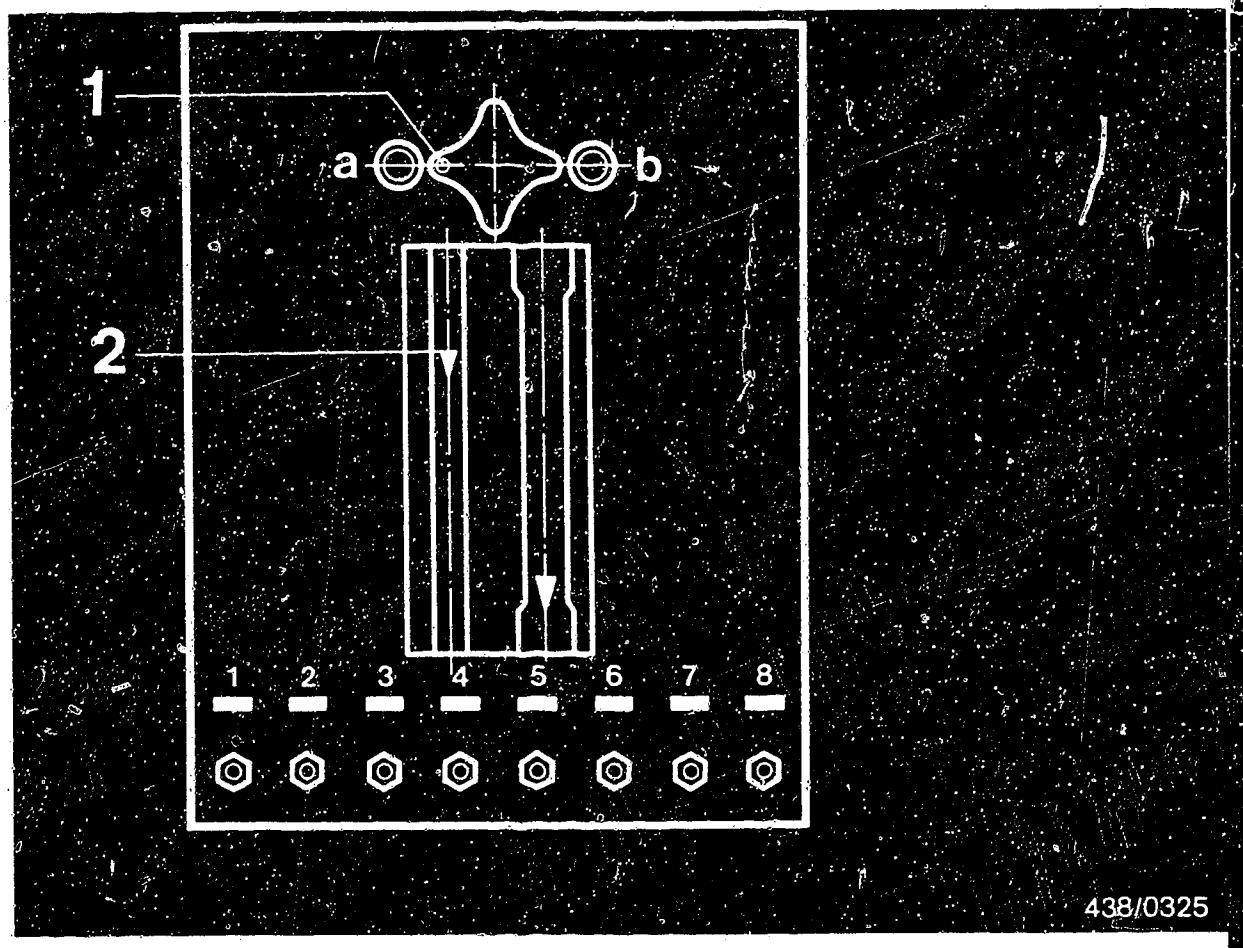
Remove the electric plugs from the warm-up regulator and the auxiliary-air device.

Switch on the electric fuel pump by bridging the electrical safety circuit.

Raise the air-flow sensor plate to the stop.

Press the keys on the 8-way valve one after the other, while simultaneously switching the 3-way stopcock until both rotameter tubes are bled.

Return the sensor plate to the rest position.

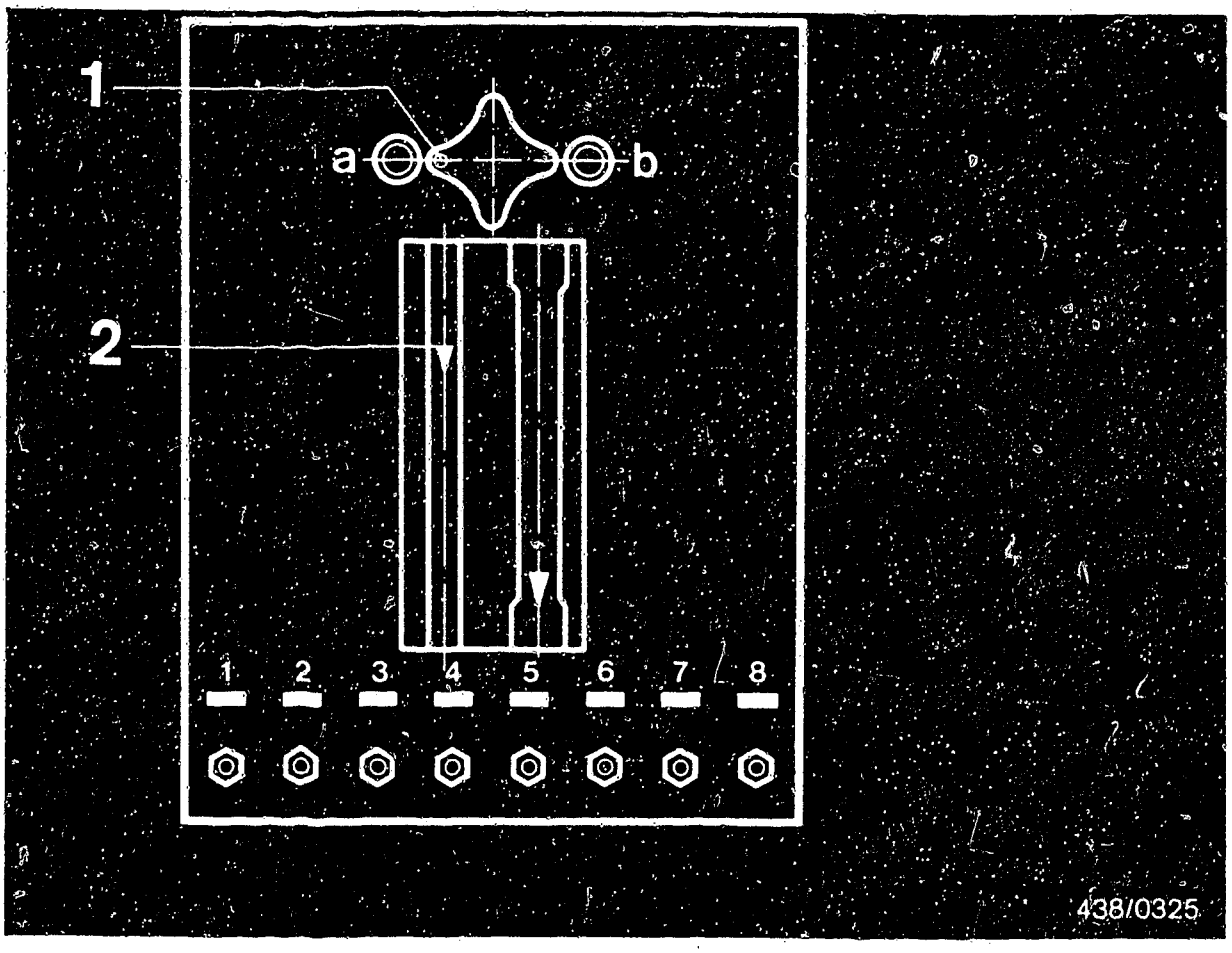


1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

18.5 Testing

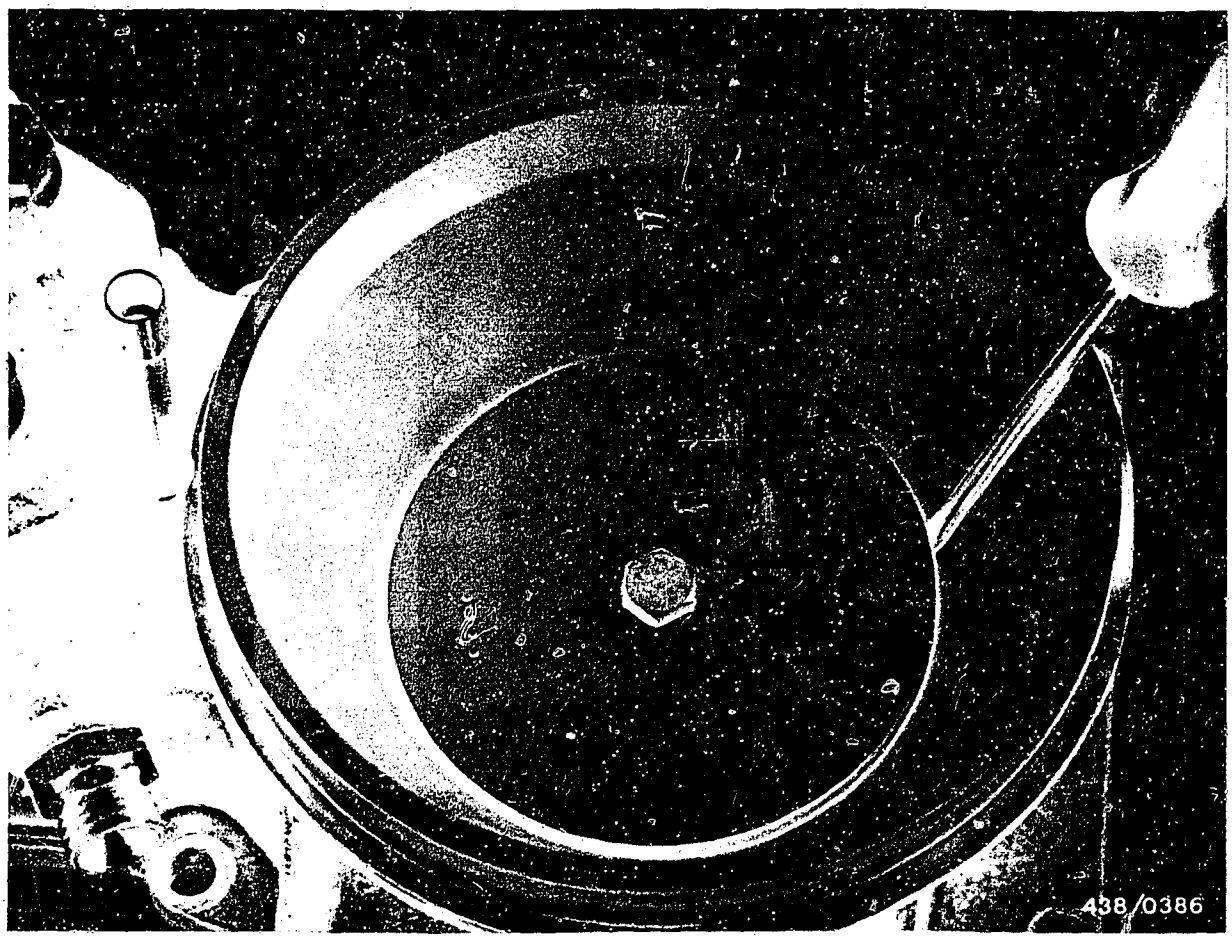
The flow comparison measurement is made in the idle, part-load and full-load ranges.
The small rotameter tube is to be used for the idle measurement (white dot to the left on control knob); part-load and full-load measurements are made using the large rotameter tube (white dot to the right).



1 = White dot
2 = Measuring line

a = Idle
b = Part load/full load

The delivered quantities indicated on the rotameter tubes are read off at the top edge of the conical float (Item 2). On testers with a ball float the uppermost point of the ball is used for reading off. With each measurement be sure to wait until the float has reached its final position. This may take 20 ... 30 seconds in the case of small deliveries.



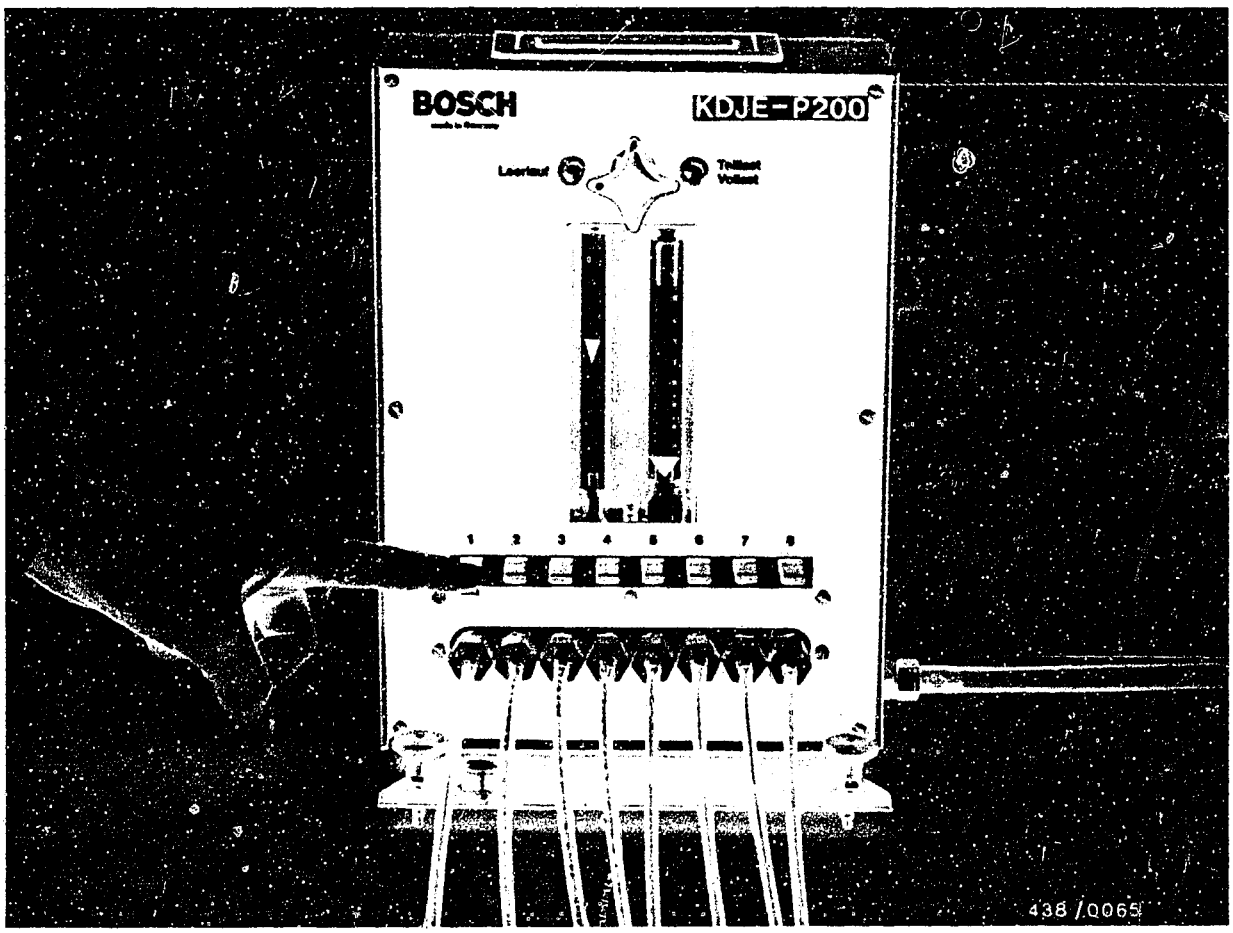
The exact setting and locating of the position of the air-flow sensor plate for the various load ranges is done using a screwdriver (a small one for the idle position), which is inserted to an appropriate depth between the air funnel and air-flow sensor plate.

Procedure:

Switch on the electric fuel pump by bridging the electrical safety circuit.

Fixed numerical values are specified in the following test section for the maximum permissible fuel delivery differences for the individual load ranges.

The "setpoint" value always pertains to the fuel-distributor outlet with the lowest fuel delivery, i.e. in each case the outlet with the lowest delivery is to be first ascertained.



Press the key for outlet 1. Pivot the air-flow sensor plate until the corresponding rotameter tube approximately indicates the "set point" value. Fix the air-flow sensor plate in this position.

Test the remaining outlets in order to determine which outlet has the lowest fuel delivery.

Press the key for this outlet again, and set the delivery precisely to the "set point" by correcting the position of the air-flow sensor plate. Then fix the air-flow sensor plate in this position again.

Press the remaining keys one after the other, and determine the maximum fuel delivery of each outlet. A deviation in fuel delivery can only be above the "set point".

18.6 Test specifications

	Setpoint (cm^3/min)	Max. permissible fuel delivery (cm^3/min)
Idle	6.0	6.8
Part load	40.0	44.0
Full load	160.0	175.0

If, in testing, a too large difference is ascertained in one of the three load ranges, the test should for safety's sake be repeated.

If the result is confirmed, you should check whether the fault lies in the fuel distributor or in the injection valves.

To do this interchange the injection valves with the greatest and smallest difference.

If the result is still the same, the fault is in the fuel distributor. If the fault follows the interchanged injection valves, it lies in the injection valves.

Change defective fuel distributor and/or replace defective injection valves.

Note on replacing fuel inlet line on fuel distributor 0 438 100 003 of 1974 model (Type 140 ..):

Using a soldering iron, cut open the fuel line in the region of the fitting and pull off.

Caution: Never use an open flame for heating the line. Danger of fire!

Cutting open the line with a knife is likewise not advisable if only the line is to be replaced and the fitting is to be used again. The tooth section of the fitting would be damaged, which may lead subsequently to leaks.

Mounting the line:

Cut off the section of the line which has been cut open.

Insert the line into assembly tool KDEP 1039 so that it projects by the amount of the length of the fitting.

Press the line cold onto the fitting.
Important: Do not heat the line for pressing on since it will undergo permanent expansion, which may lead subsequently to leaking.

Before installing the injection valves, check the condition of the rubber cup seals. Defective, cracked or swollen cup seals must be replaced (Volvo service part).

When installing, make sure that the injection valves are properly seated.

Re-install the air-intake dome and finally check the idle adjustment, correcting if necessary.

Idle adjustment is described on Coordinates F6.

19. Idle adjustment

19.1 Test conditions:

Warm the engine up for the idle adjustment (oil temperature approx. 80°C).

Important note:

If injection lines or injection valves have been loosened or removed, warm the engine up under load. The low fuel throughput at idle is not always sufficient to drive all the air out of the injection lines.

The idle adjustment must not be performed when the engine is too hot, e.g. immediately after being raced or after a power measurement on the chassis dynamometer.

In vehicles with an air conditioner, this should be switched off in order to stabilize the engine speed for the idle adjustment.

Measure the engine speed with a separate tachometer.

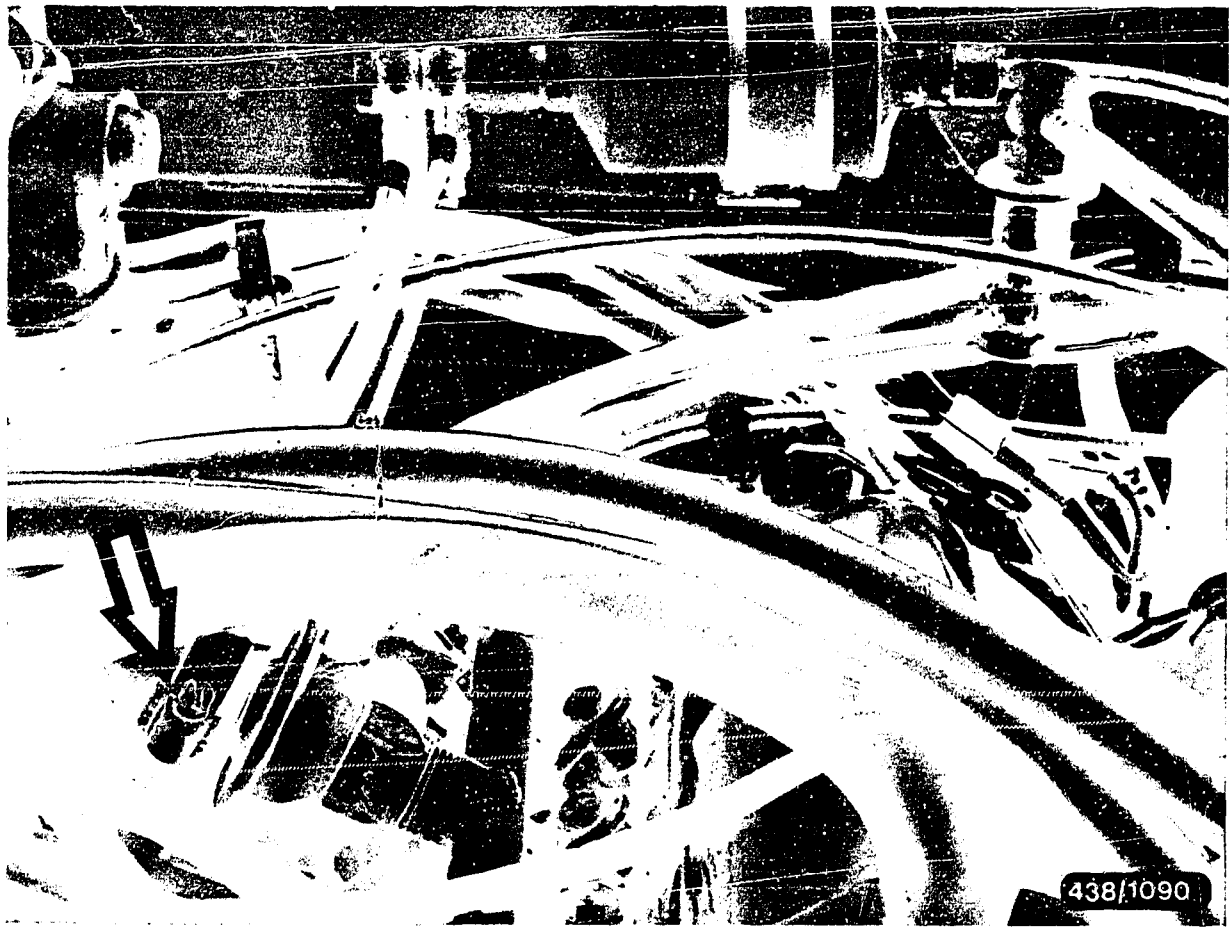
Check whether the throttle lever is up against the idle stop. The cable must be set free of tension.

Further test conditions for engine B 20 F (USA model) model year 1975:

These vehicles are equipped with exhaust-gas recirculation and secondary-air pump; the California model is additionally equipped with a catalytic converter.

The exhaust-gas recirculation system must be rendered inoperative for the exhaust-gas measurement at idle speed. To do this, disconnect the exhaust-gas line between EGR valve (mount under throttle-valve assembly) and intake manifold, and seal off tight the exhaust-gas line and the fitting.

On the California model with catalytic converter the exhaust-gas is sampled as usual at the tail pipe, but the lower exhaust-gas value (see test specifications) must be observed.

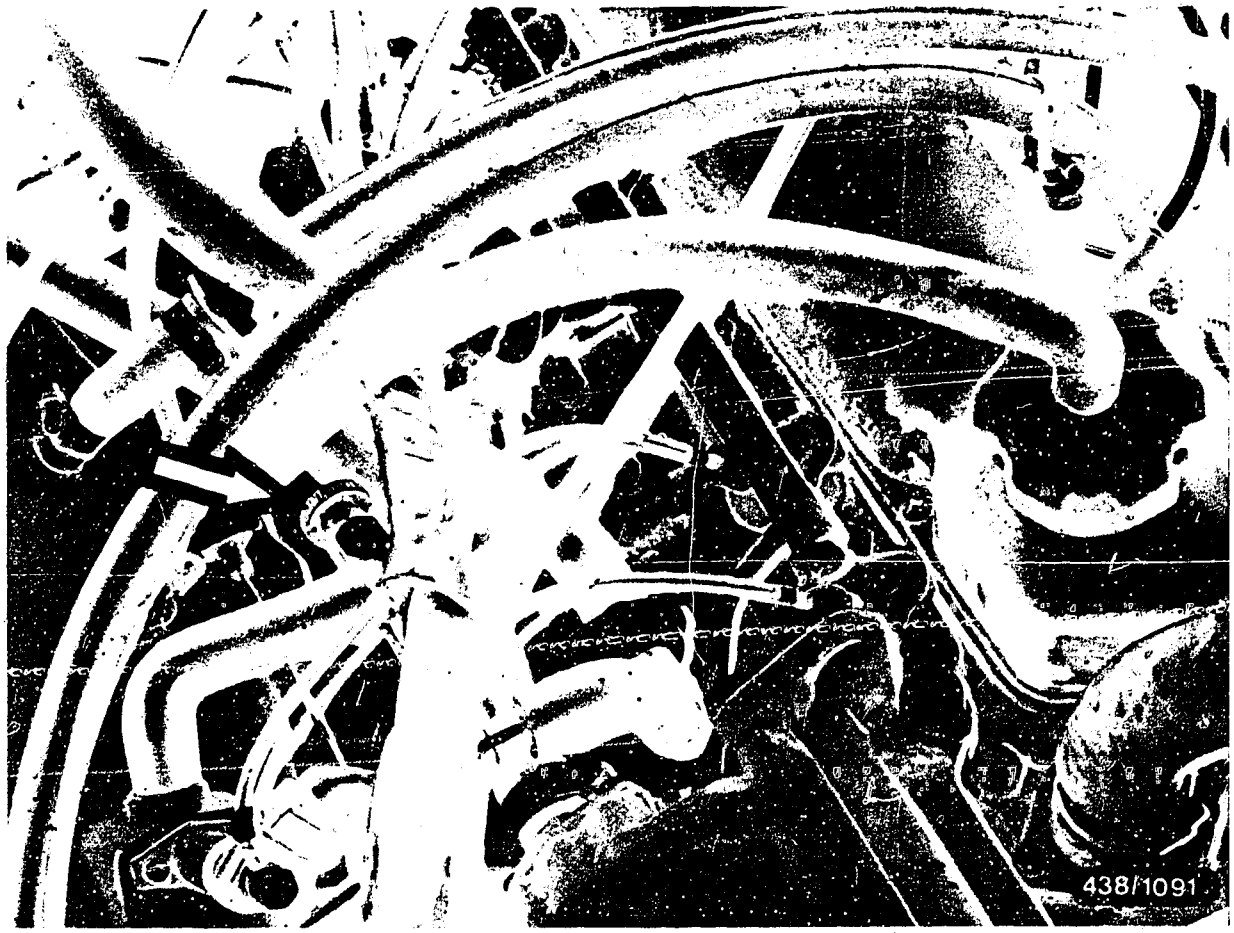


The secondary-air injection system must likewise be switched off for the idle adjustment. To do this, remove the pressure hose from the overflow valve (arrow) and seal off the valve fitting tight with a plug.

19.2 Test specifications for idle adjustment:

Idle speed: 900 min^{-1} (manually-shifted transmission)
800 min^{-1} (automatic)

CO concentration (% by vol.): 0.5...3.0% (general)
0.5...1.5% (USA)
max. 0.5% (USA-California)



19.3 Adjustment:

Adjust the idle speed at the bypass screw in the hose line before the auxiliary-air device (arrow).

Adjust the CO concentration by turning the idle-mixture-adjusting screw in the air-flow sensor using adjusting wrench KDEP 1035.

After removing the rubber plug, the wrench is inserted through the bore between fuel distributor and air funnel into the idle-mixture-adjusting screw in the control lever.

Turning in a clockwise direction = enriches the mixture
Turning in a counterclockwise direction = leans the mixture

Caution:
Always make the adjustment from the lean side, i.e. if the mixture is too rich turn the idle-mixture-adjusting screw further to the left than necessary and then turn it to the right up to the setting required.

After every adjustment remove the adjusting wrench and accelerate the engine briefly, so that the air-intake system can cool off. Then wait until the indicator of the CO tester has stabilized. Never accelerate the engine with the wrench still in place as this could result in bending the control lever in the air-flow sensor.

After-sales Service

Technical Bulletin

43

Continuous Injection System mixture control-unit

VDT-I-438/100 B

Ed. 2 7.1975
Translation of German edition of 1.7.1975

The mixture control unit is still being reported as one defective unit in warranty claims. We wish to point out expressly that the mixture control unit consists of two separate products, the air-flow sensor and the fuel distributor, and that there are separate defect numbers for them in the warranty manual. Please report only the defective product.

Accessory Sets

Various fuel distributors and warm-up regulators have been supplied up to now with pressed-in plug connectors. These will no longer be supplied in future.

	no longer available	Replacement + accessory set
Fuel distributor	0 438 100 002	0 438 100 017
	0 438 100 003	0 438 100 005 + 2 437 001 001
	0 438 100 004	0 438 100 01[illegible]
Warm-up regulator	0 438 140 002	0 438 140 004 + 1 437 000 000

The accessory sets contain the required number of tailpieces and seal rings.

Please note: the accessory set 2 437 001 000 is delivered included with the fuel distributor 0 438 100 017, and does not therefore need to be ordered separately.

Electric Fuel Pump

In the Technische Mitteilung VDT-BMO 114/1 B and the Service Information sheet VDT-I-740/2-1 B 1st supplement, we announced that the non-return valve can be replaced on the electric fuel pump 0 580 254 996. We have come to the conclusion from the warranty claims that not enough use is being made of this possibility, Please bear this fact in mind and repair leaky electric fuel pumps before deciding to replace the entire assembly.

In case of inquiry, please contact your authorized representative.

ROBERT BOSCH GMBH
Geschäftsbereich KH
Kundendienst - Technik

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

Packaging of goods under warranty

438

K-Jetronic (CIS)

VDT-I-438/101 B
10. 1976

All components or assemblies of the K-Jetronic which are dispatched under warranty must be correctly and carefully packaged so that no further damage or impairments occur during transit, since these would not be covered by warranty.

Any fuel remnants must be removed from those K-Jetronic assemblies intended for dispatch, so as to eliminate any danger of fire during transit.

The intake openings and outlets of the assemblies must be sealed off with caps or plugs. As new products were fitted, the caps or plugs from these may be used.

The plunger of the fuel distributor is to be fitted with a protective cap of adequate size, or secured to the fuel distributor.

In addition, the assemblies are packed in tightly packed, well-sealed plastic sleeves. Fuel distributors and warm-up regulators are packed individually.

If components arrive damaged due to incorrect packaging or do not comply with these instructions, they can be returned and the warranty claim rejected.

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After-sales Service

Technical Bulletin

EXCHANGEABLE NON-RETURN VALVES
in electric fuel pumps 0 580 254 ..

VDT-I-438/104 En
3.1983
(Replaces Ed. 5.1982)

Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal
0 580 254 001	1 587 010 500	---	---
002	500	---	---
0 580 254 003	502	---	---
004	502	---	---
005	502	---	---
006	502	---	---
007	500	---	---
948	005	---	---
949	002	---	---
950	006	---	---
951	006	---	---
952	002	---	---
953	501	---	---
954	002	---	---
956	002	---	---
957	002	---	---
958	002	---	---
959	002	---	---
960	002	---	---
961	002	---	---
962	002	---	---
963	005	---	---

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Electric fuel pump	Parts set (non-return valve + seal ring)	Non-return valve	Seal ring
0 580 254 964	1 587 010 002	---	---
965	002	---	---
966	002	---	---
967	002	---	---
968	002	---	---
969	002	---	---
970	002	---	---
971	002	---	---
972	002	---	---
973	002	---	---
974	002	---	---
975	003 (4)	---	---
976	004 (3)	---	---
977	004 (3)	---	---
978	1 587 410 901	---	---
979	010 004 (3)	---	---
980	002	---	---
981	002	---	---
982 (1)	003 (4)	---	---
982 (2)	1 587 410 901	---	---
984	010 004 (3)	---	---
985	---	1 583 385 006	1 580 203 002
986	---	386 011	001
987	---	008	001
988	---	008	001
989	---	008	001
990	---	385 004	002
991	---	004	002
992	1 587 010 001	---	---
996	---	386 011	001
998	---	385 004	002
9 580 234 003	002	---	---
005	002	---	---

1 = up to FD 822 2 = from FD 823

3 = Parts set ..003 also possible (delivery-line connection at 90°)

4 = Parts set ..004 also possible (delivery-line connection axial)

After-sales Service

Technical Bulletin

HOT-STARTING PROBLEMS

438

VDT-I-438/105 En
3.1980
Replaces Ed. 2.1980

K-Jetronic

Hot-starting problems can occur in various vehicles fitted with K-Jetronic. This means that when an engine is switched off whilst still hot and then switched on again after a short period, it does not start as well as it should.

The engine, the ignition system and the K-Jetronic system in these vehicles should be carefully checked. With the K-Jetronic particular attention should be paid to the:

complete system (in case of leaks),
injection valves (in case of leaks),
correct position of the air-flow sensor plate (rest position).

Instructions can be found in the vehicle-related repair manuals VDT-W-438/5.. .

If the engine still does not start satisfactorily when hot, even after checking, a timing relay can be fitted in K-Jetronic systems which are not equipped with a solenoid valve for reducing the control pressure as additional starting help.

Timing relay 0 340 000 003 controls the start valve during hot starts. The start valve then injects extra fuel intermittently (sometimes cutting out completely.

The timing valve is fitted according to the wiring diagram (see reverse side). The fitting of this relay will be charged for.

After fitting the timing relay starting should be carried out as follows:

Vehicles with start valve in intake manifold - with open throttle valve,
Vehicles with start valve in idle duct - with closed throttle valve.

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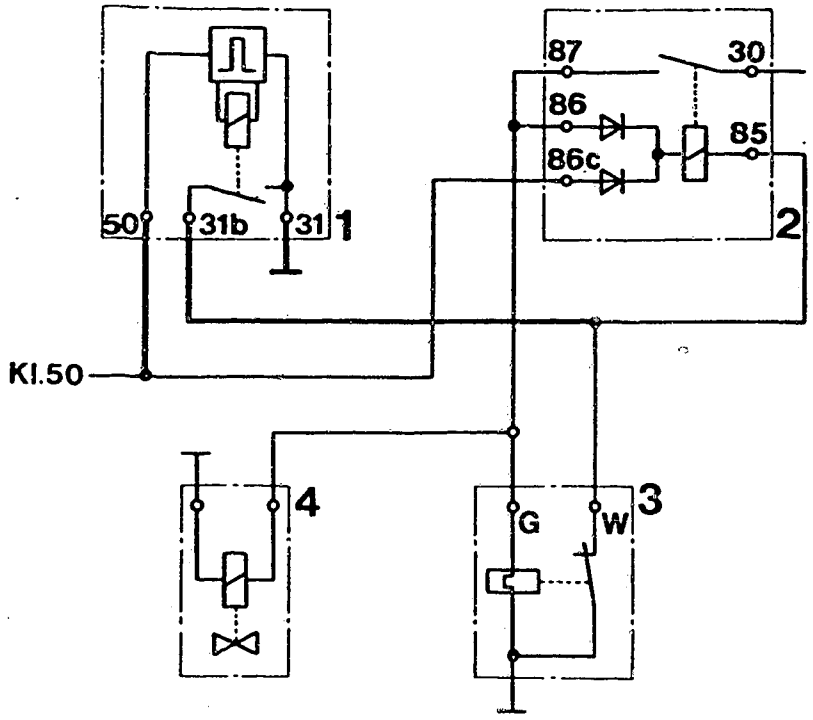
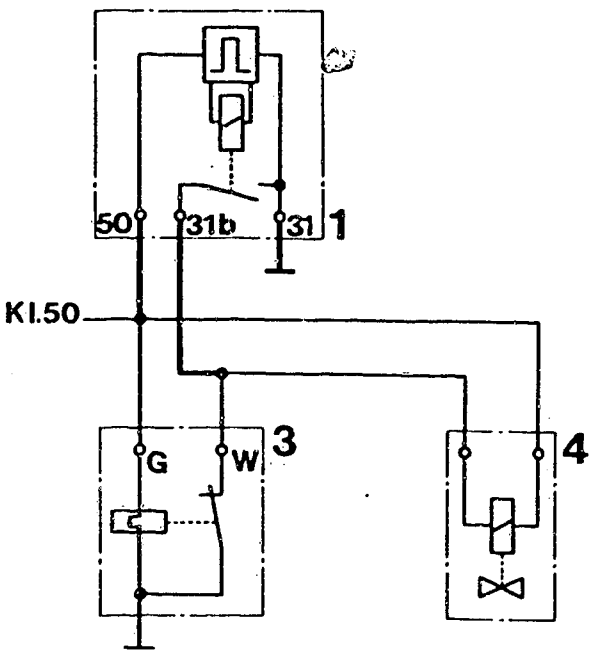


K-Jetronic system with post-injection relay

1 = Timing relay 0 340 000 003
2 = Post-injection relay
3 = Thermo-time switch
4 = Start valve



K-Jetronic system without post-injection relay

After-sales Service

Motor Vehicle Service Information

EXPORT VEHICLES WITH
EMISSION CONTROL SYSTEMS

VDT-I-Gen. 042 En.
12. 1981

K-Jetronic and L-Jetronic

Export vehicles for countries with stringent exhaust emission regulations are equipped with various emission control systems. To meet the legal requirements, these systems are installed either individually or in combination, depending on the model version.

Emission control system	installed predominantly in export vehicles				
	Sweden	Australia	Canada	USA	Japan
Exhaust-gas recirculation*	●	●	●	(●)	(●)
Secondary-air induction*	●	●	●	(●)	(●)
Secondary-air injection*	●	●	●	(●)	(●)
Catalytic converter*	-	-	-	●	●
Lambda closed-loop control	-	-	-	●	●

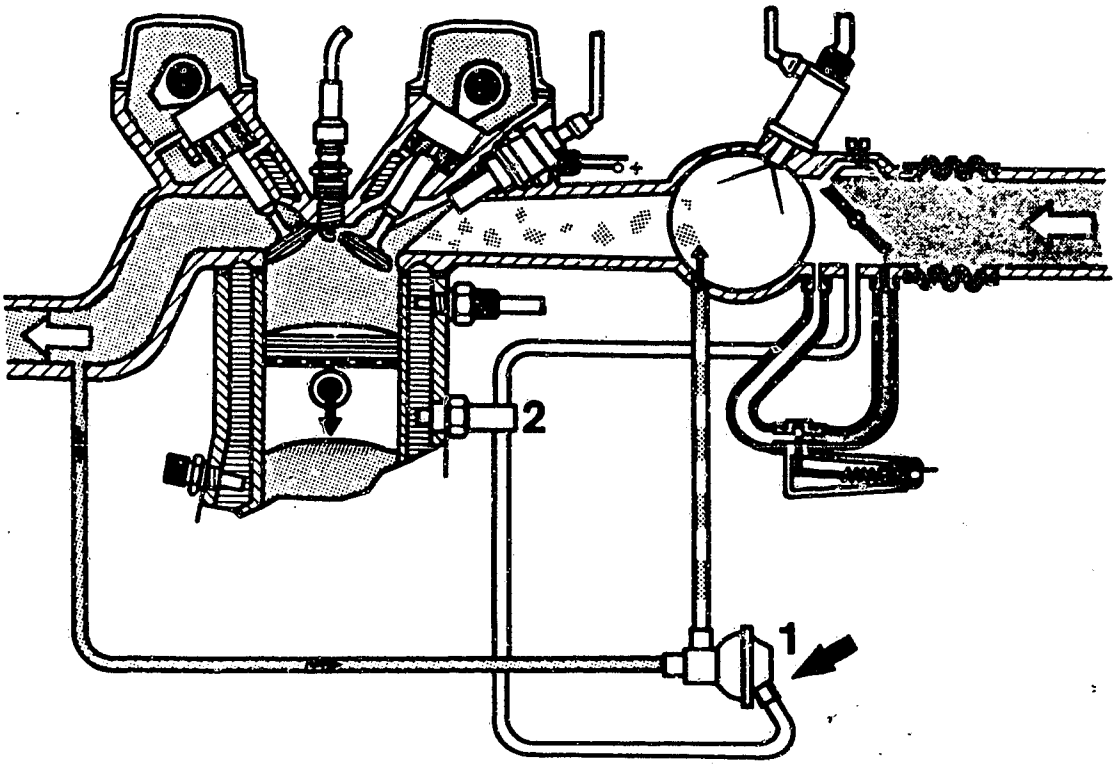
The vehicle-related After-Sales Service Instruction Manuals for the K-Jetronic and L-Jetronic describe the construction, function and operating principle of the emission control systems. The influence of these systems should be borne in mind particularly when adjusting the idle speed and CO concentration.

Export vehicles are sometimes also encountered in countries which do not have particularly stringent exhaust emission legislation. This Service Information publication summarizes the various emission control systems and provides information for the After-Sales Service in countries with exhaust emission legislation which does not require such emission control systems or unleaded fuel.

* Not made by Bosch

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

1. Exhaust-gas recirculation (EGR)



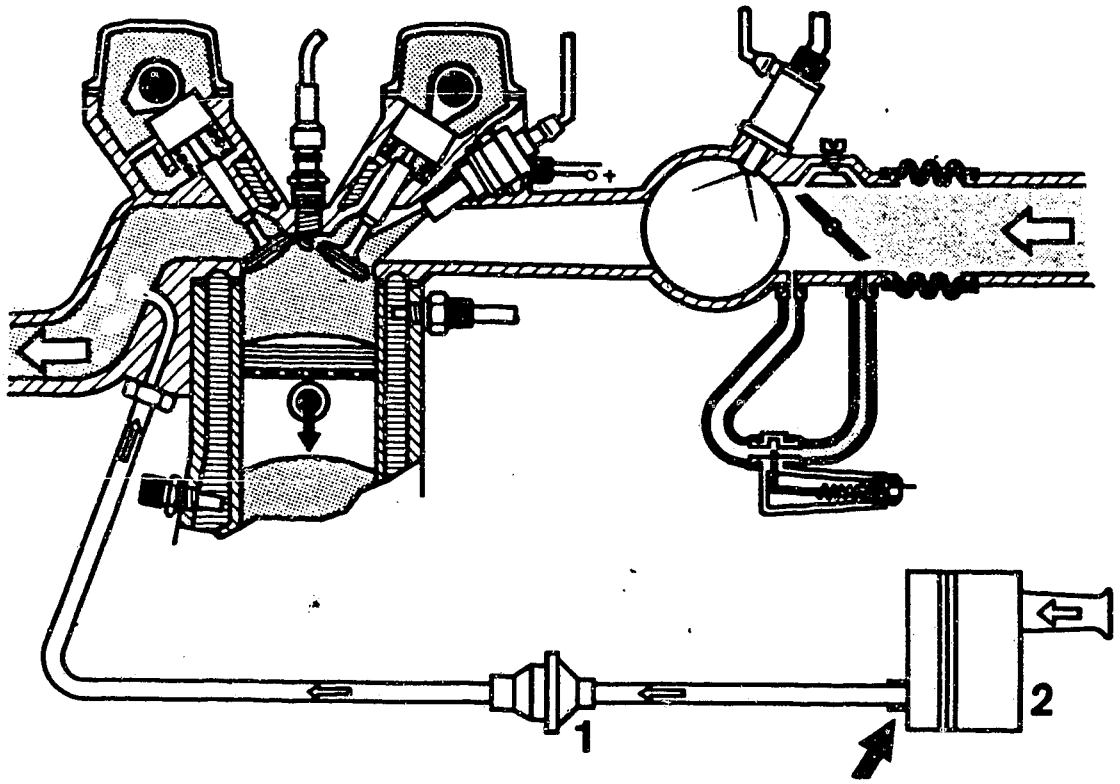
1 = Exhaust-gas recirculation valve 2 = Thermo-valve

Some of the exhaust gas is returned to the intake manifold via a vacuum-controlled exhaust-gas recirculation valve. This recirculation of exhaust gas into the combustion chamber lowers the combustion temperature and reduces the emission of nitrogen oxides (NOx). The thermo-valve and the position of the vacuum tapping port on the throttle-valve assembly ensure that exhaust gas is only recirculated when the engine is warm and only at part load. There is a reduction in engine speed of about 200 min^{-1}. Exhaust-gas recirculation is inoperative at idle, full-load and when the engine is cold.

When testing or adjusting the idle speed and CO concentration, remove and seal off the vacuum control line (arrow) on the exhaust-gas recirculation valve in order to ensure that the exhaust-gas recirculation system is inoperative.

In countries without stringent exhaust emission legislation it is not necessary to shut down the system.

2. Secondary-air induction (e.g. Volvo Pulsair system)



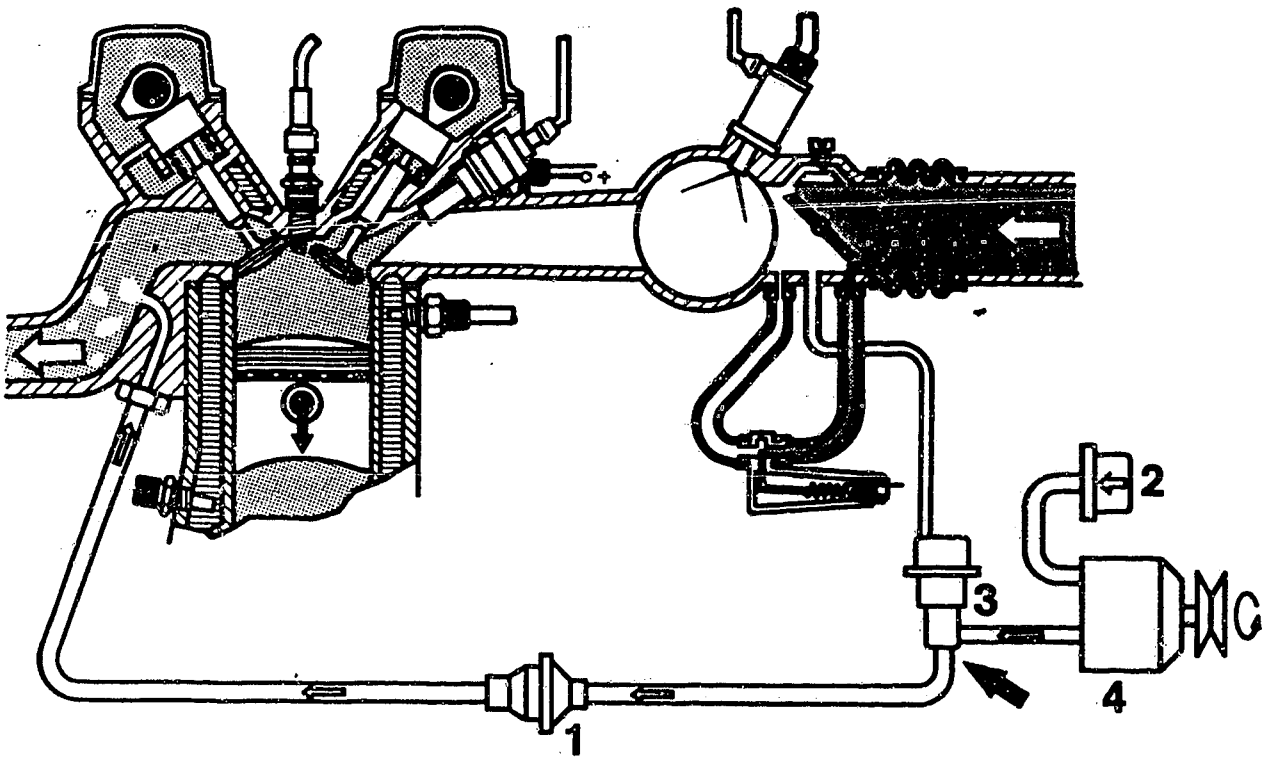
1 = Non-return valve 2 = Air filter

The pulsating alternation between overpressure and depression in the flow of exhaust gas inducts fresh air into the exhaust ports via a non-return valve. Unburned residues of carbon monoxide (CO) and hydrocarbons (HC) are partially after-burned, leading to fewer pollutants in the exhaust gas.

When testing or adjusting the idle speed and the CO concentration, the secondary-air induction system must be rendered inoperative. To do this, remove the hose between the non-return valve and the air filter on the air filter (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air induction system.

3. Secondary-air injection



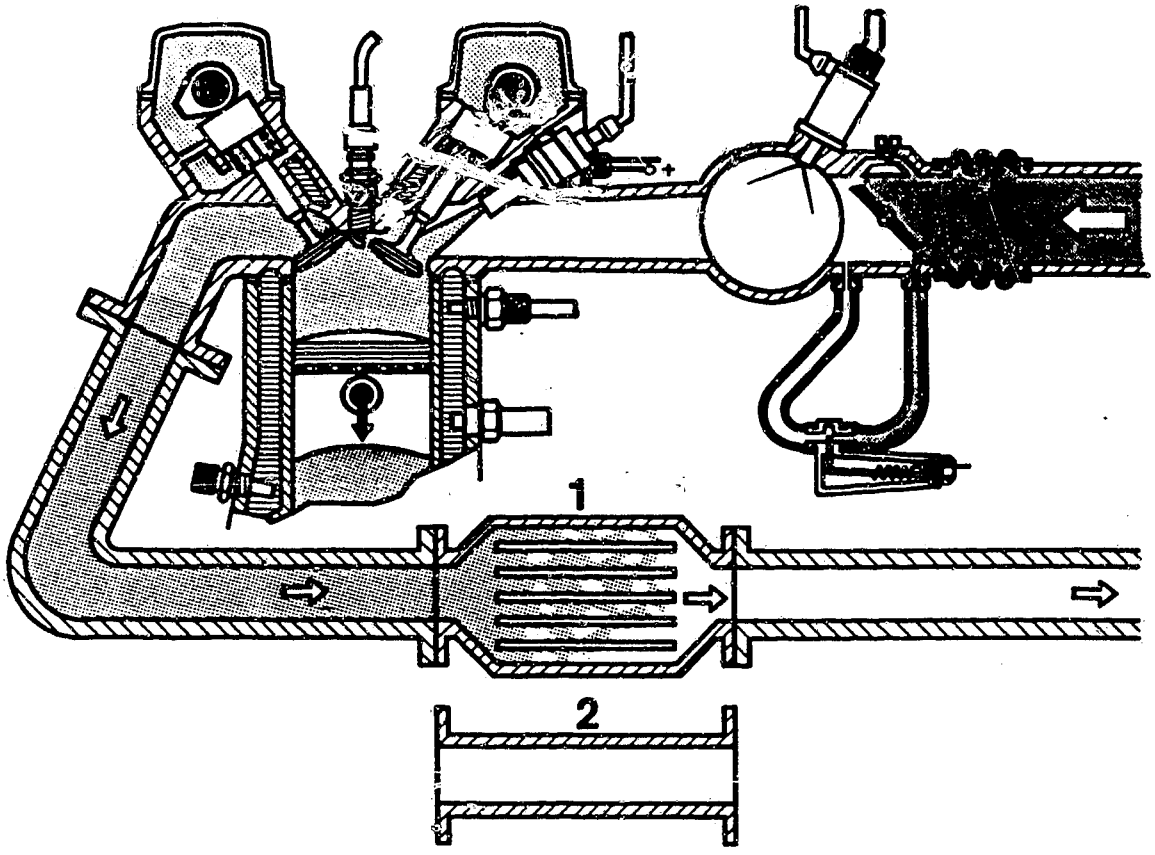
1 = Non-return valve
2 = Air filter
3 = Change-over valve
4 = Air pump

An air pump driven by the engine inducts fresh air through the air filter and forces it via a non-return valve into the exhaust ports. As in the case of secondary-air induction, there is a partial after-burning of the CO and HC residues. This makes the exhaust gas cleaner. A vacuum-controlled change-over valve controls the operation of the secondary-air injection system.

When testing or adjusting the idle speed and the CO concentration, shut down the secondary-air injection system. To do this, remove the hose from the outlet of the change-over valve (arrow) and seal off tight with a plug.

In countries without stringent exhaust emission legislation it is not necessary to shut down the secondary-air injection system.

4. Catalytic converter



1 = Catalytic converter 2 = Intermediate pipe

The single-bed catalyst installed in the exhaust system in export vehicles (also with lambda closed-loop control) reduces all three pollutants CO, HC and NOx to a minimum. The catalytic surface triggers chemical reactions of the pollutants, rendering them non-toxic.
Important: Proper operation only possible in conjunction with unleaded fuel (at present only in USA and Japan).

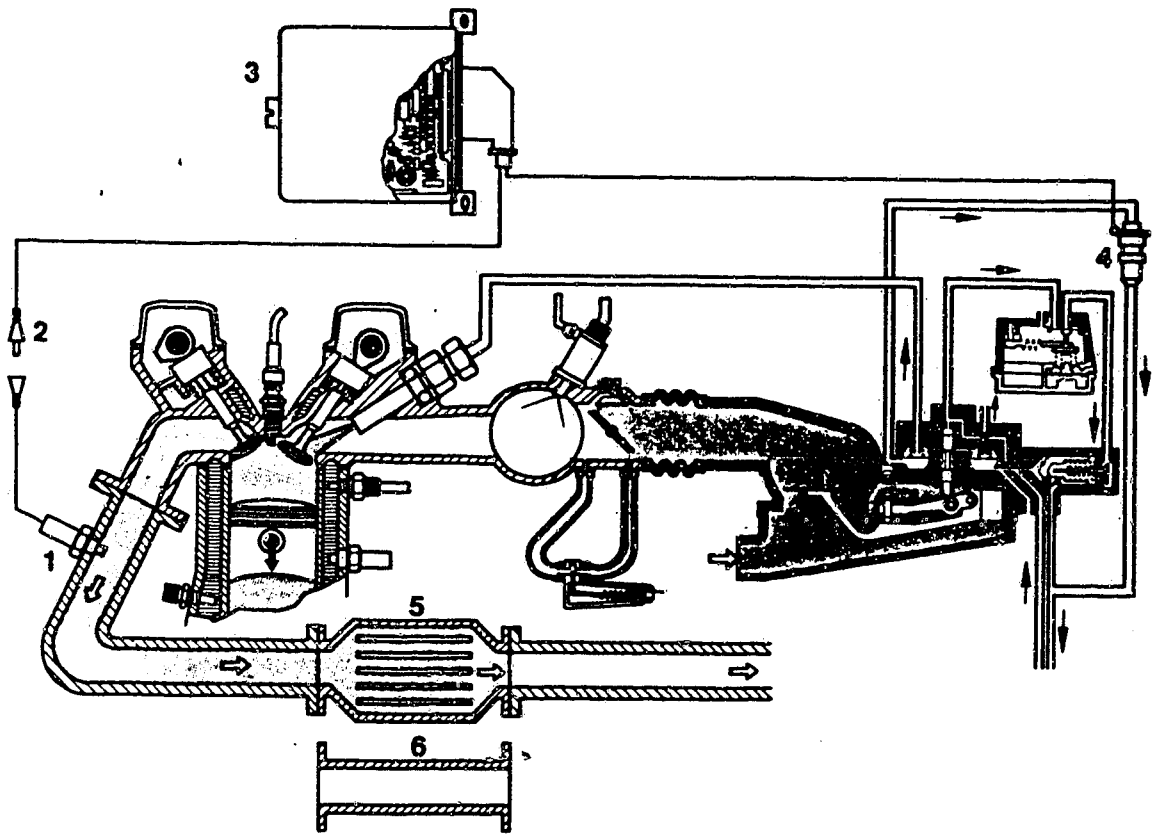
When testing or adjusting the idle speed and the CO concentration, the catalytic converter can be neglected since the exhaust-measuring point is upstream of the catalyst.

Caution!

If the vehicle is operated on leaded fuel (predominantly in countries without stringent exhaust emission legislation) the catalytic converter must be removed. If not removed, the catalytic converter would become clogged up and lead to a reduction in the power output of the engine.

Appropriate intermediate pipes for converting the exhaust system are available from the vehicle manufacturer.

5. Lambda closed-loop control



1 = Lambda sensor
2 = Plug
3 = Control unit
4 = Timing valve
5 = Catalytic converter
6 = Intermediate pipe

Export vehicles for the USA and Japan are equipped with lambda closed-loop control. This additional function of the K-Jetronic or L-Jetronic is not a downstream emission control system, but ensures a low pollutant content in the exhaust gas by means of optimum mixture preparation. Additional exhaust-gas recirculation, secondary-air induction or secondary-air injection is therefore not necessary in most cases. Like the catalytic converter, the lambda sensor (in the exhaust gas) operates only with unleaded fuel.
If the vehicle is operated on leaded fuel, the lambda sensor becomes clogged up and ceases to operate. The control unit detects this and switches from closed-loop to open-loop control. The system then operates on a fixed air-fuel ratio in the same manner as a K-Jetronic or L-Jetronic without lambda-closed-loop control. Before operating on leaded fuel, the lambda sensor should be removed and the installation hole should be closed off with a screw plug M18x1.5 (length of thread max. 8.5 mm). The disconnected plug (2) of the sensor connecting cable should be insulated and fastened to a suitable place on the vehicle body.

Caution!
Under no circumstances must the control unit or the timing valve be shut down on the lambda closed-loop control of the K-Jetronic.
The catalytic converter should be replaced by an intermediate pipe.

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After-sales Service

Motor Vehicle Service Information

HOT-STARTING PROBLEMS

on vehicles fitted with Jetronic

VDT-I-Gen. 050 En
9.1982

Customer complaints

If the vehicle is parked and the engine switched off after having been run at normal operating temperature, it often occurs that the engine proves difficult to start, or won't start at all, and when it does start it runs extremely roughly (only on 2 or 3 cylinders). The engine has to be accelerated a number of times before it runs smoothly.

Causes

For economic reasons ("stretching" of the mineral-oil reserves), it can happen that alcohol in varying quantities has been added to gasoline. Methanol is used for instance.
Such alcohol-added fuels, depending upon the amount of alcohol, adversely affect the hot-starting characteristics of the engine. The addition of alcohol raises the vapor pressure of the fuel and the result is that the boiling point of the alcohol-fuel mixture drops. This in turn leads to the formation of fuel-vapor locks in the fuel system when the engine has been switched off.

This means that when starting, and during the subsequent idle period, the air-fuel mixture is temporarily too lean.

Remedies

- Check the ignition and Jetronic systems, particularly for leaks.
- Changing to another brand of gasoline can sometimes cure the problem immediately.
- In many cases, fully depressing the gas pedal helps during starting, as does slightly depressing the gas pedal during the idle period until the engine runs smoothly.
- Fit the pulse relay 0 340 000 003 (refer also to VDT-I-438/105) in vehicles with K and D-Jetronic.
  This step, though, will still not fully alleviate the rough running of the engine during the starting off phase

Note:

The pulse relay 0 340 000 003 is NOT to be installed in vehicles fitted with L-Jetronic.

Please direct questions and comments concerning the contents to our authorized representative in your country.

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After-sales Service

Motor Vehicle Service Information

COLD START - WARM UP
ACCELERATION PROBLEMS

VDT-I-Gen. 051 En
10.1982

in vehicles with Jetronic

Customer complaints

- Starting problems with a cold engine
- Engine bucking during warm up
- Uneven idle (speed fluctuations)
- Engine cuts out during acceleration (flat spot)
- Loss of output

Cause

When the ignition and the Jetronic have been checked and the test specifications given have been reached, a possible reason for the problems quoted could be coke residue on the intake valves.

The carbon residue thus present delays a continuous flow of fuel from the injection valve to the combustion chamber on account of its sponge effect.

As a result of this the air-fuel mixture can in some cases be so lean, that it can no longer be ignited.

Loss of output results from a reduction in the amount of cylinder filling and is caused by a very high coking.

Complex connections between qualities specific to the engine, the engine oil and fuel used, as well as relevant driving cycles (e.g. mainly short stretches) can cause such coking on the intake valves.

Remedy

Dismantle the intake valves and remove the deposits.

Please note

Various vehicle manufacturers are working at the moment on other measures, such as cleaning with additives. Results of these tests are not yet available.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

After-sales Service

Motor Vehicle Service Information

LIQUID PETROLEUM GAS (AUTOGAS) SYSTEMS AND VEHICLES WITH K-JETRONIC

VDT-I-Gen. 052 En
10.1982

Fitting at a later stage

Vehicles with K or L-Jetronic are not suitable for fitting at a later stage with liquid petroleum gas (LPG) systems.

Numerous problems can occur, such as:

- Reduction of fuel flow through the injection valves due to deposits
- Stiffness or blocking of the K-Jetronic fuel distributor plunger (due to gumming or similar) in the course of time with "gas only operation."
- Increased danger of backfiring in the intake manifold (burbling) and thereby damage to the air-flow sensor.

Guarantee

Guarantee claims for failed Jetronic components from vehicles thus converted will not be accepted.

Conversion to liquid gas operation is made at the risk of the vehicle owner.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

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Automotive Equipment - After-Sales Service,
Department for Technical Publications KH/VDT,
Postfach 50, D-7000 Stuttgart 1

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Please direct questions and comments concerning the contents to our authorized representative in your country.

10. Checking and adjusting the position of the air-flow sensor plate

10.1 Preparations

- Engine temperature is not important.
- Remove the rubber hood fitted between the air-flow sensor and the throttle-valve assembly (release 2 clamping bands), so that the air-flow sensor plate becomes accessible.